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Three studies dealing with the educational implications of technological change are presented. "The Application of Computer Technology to the Improvement of Instruction and Learning" by Don D. Bushnell, Richard deMille, and Judith Purl is based on 35 research and development programs involving computer technology. Their general thesis is that current educational use of computers is for administrative and logistical control purposes but the future potential of such applications will be in instructional activities. "The Emerging Technology of Education" by James D. Finn reviews related literature, identifies trends, and discusses implications of technology for education. Gabriel D. Olfiesh makes "A Proposal for a National Research and Development Program in Educational Technology for American Education." A series of eight papers by the staff of the College of Education, University of Iowa, presents an analysis of numerous implications which technological change has for education. Other appendixes to VT 003 962 are VT 003 960, VT 003 961, and VT 005 794-VT 005 796. (EM)

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Appendix Volume IV,
TECHNOLOGY AND THE AMERICAN ECONOMY,
The Report of the Commission .

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EDUCATIONAL IMPLICATIONS OF TECHNOLOGICAL CHANGE

Appendix Volume IV

TECHNOLOGY AND THE AMERICAN ECONOMY,
The Report of the Commission

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
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PREFACE

This volume is the fourth of six appendix volumes to Technology and the American Economy, the report of the National Commission on Technology, Automation, and Economic Progress. The full series of appendix volumes is as follows:

I. The Outlook for Technological Change and Employment
II. The Employment Impact of Technological Change
III. Adjusting to Change
IV. Educational Implications of Technological Change
V. Applying Technology to Unmet Needs
VI. Statements Relating to the Impact of Technological Change

This volume consists of three studies dealing with the educational implications of technological change, prepared by independent experts at the request of the Commission.

Bushnell, DeMille, and Purl in one paper and Finn and Oficsh in another explore the many promising experimental developments underway to use computers and other new technologies in the education process. Then the College of Education at the University of Iowa, with assistance of education experts from other universities, undertakes an extensive analysis of the numerous implications of technological change for education policy.

Additional studies prepared for the Commission are contained in Appendix Volumes I, II, III, and V. Appendix Volume VI contains a group of statements by various interested organizations and individuals in response to a request from the Commission for their views on the impact of technological change.

Though the Commission does not necessarily endorse the information and views of these documents, it considers them of sufficient value to have directed their publication.

This volume was edited and prepared for publication by Judith Huxley.

GARTH L. MANGUM,
Executive Secretary.

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I. The Outlook for Technological Change
II. The Employment Impact of Technological Change
III. Adjusting to Change
V. Applying Technology to Unmet Needs
VI. Statements Relating to the Impact of Technological Change

THE APPLICATION OF COMPUTER TECHNOLOGY TO THE IMPROVEMENT OF INSTRUCTION AND LEARNING

Prepared for the Commission
by
Don D. Bushnell
Richard de Mille
and
Judith Purl
The Brooks Foundation
Santa Barbara, Calif.

FOREWORD

The survey reported here represents the fruits of some 35 current research and development programs which apply computer technology to educational problems. Even with a cursory scanning of this report, it will become readily apparent that the majority of the applications discussed are directly related to instructional processes. It is the general thesis of this report that while it is true that the major use of the computer in education today is for administrative and logistical control purposes, the future potential of electronic information processing seems to lie in its applications to instructional activities.

The goal of education for all Americans, the challenging reality of individual differences, an exploding curriculum, and pressures of time and numbers make the use of modern information processing technology essential. Information problems are woven through the whole fabric of educational processes, but most particularly in the area of instructor-learner interaction. The computer may help to bring the study of this interaction process within manageable bounds. The day is not too far off when good teaching will become a science as well as an art.

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RECOMMENDATIONS

The recommendations set forth below are summarized from the body of the report. With the application of computer technology to the improvement of human learning problems, a means of applying the power of the computer to the solution of the problems of automation has been brought to contemporary society.

1. Because school dropouts have been failed by traditional educational practices, new learning applying the power of the computer to the solution of the problems of automation has been brought to environments must be developed providing frequent opportunities for success, active and individualized curriculum programs with immediate relevance to the life of the student, and increased peer group interaction. Gaming techniques offer many of the combinations essential to reaching the disadvantaged student. A major effort for the research, development, and application of game materials is recommended.

2. Few, if any, texts or instructional materials which are commercially available can boast hard data based on objective evaluation. Methodology is sorely needed for the determination of the efficacy of material for various populations of students or for establishing empirical data on the relative effectiveness and efficiency of comparable texts. School district support should be given to projects seeking to originate, test, and repetitively modify pilot instructional packages (including multimedia resources) that permit many approaches to the explication of subject matter and that apply various strategies to the learning task; e.g., inductive versus deductive, and verbal versus pictorial.

3. Recognizing the power of the computer for massive data collection, controlled observation, and analysis, feasibility studies are needed for exploring various means of utilizing computer-monitored instructional systems—i.e., those systems designed to learn about students as they are being taught. By collecting data on what has been learned, researchers have a means for controlling and assessing student-teacher interactions and thereby for establishing a science of instruction.

4. In a modern educational system, one integrated information center could serve the needs of the student, teacher, counselor, and administrator. Massive support should be extended to projects proposing to link school districts and universities to the major catalogs of the Nation and to the information centers of the community and region.

5. Support must be given to projects seeking to apply automated data processing programs to the development of flexible scheduling routines, counseling programs, and advanced planning simulators.

6. Funds should be allocated to pilot projects seeking to apply time-shared input and output stations for meeting both administrative and student information needs. By utilizing this network of remote inquiry stations, all parties can have essentially simultaneous access to the retrieval and computational powers of the computer center for problem solving, storing, and retrieving information.

7. Studies should be supported which propose to recommend basic minimal data items for information processing at various levels of education (local, regional, State, and Federal) for the purpose of standardizing terminology and formats, thereby insuring intersystem compatibility.

8. If on-line, time-shared computer applications are ever to become a normal part of the operating school, the cost per student must be greatly reduced. Low-cost applications and hardware need development. To achieve this, industry must see education as a major market of the future.

9. Many researchers still cling to the formal hypothesis testing approach to educational research, even though it has been repeatedly demonstrated that it is a limited one for gaining meaningful insights into the dynamics of education. Effective teaching materials, for example, are not produced by hypothesis testing experiments. Behavioral engineering based upon repetitive cycles of testing and modification seems to hold greater promise for producing appropriately tailored instructional materials. It is recommended, then, that other attacks on educational problems be developed in contrast to the formal hypothesis testing methodolgy used so traditionally by educational researchers.

10. Computer aids to the author of instructional materials can be found in much of the work related to computer-assisted instruction. Large numbers of such research programs should be supported in a massive effort to fill the educational materials gap. This gap is particularly critical in the area of instructional items appropriate for individualized study.

11. More frequent dialogues between computer technologists and educational practitioners should be encouraged. Conferences and an information exchange on automated technology should be supported by Federal and private funding agencies.

12. Better theories of counseling and instruction, curriculum development and revision, and school organization may result through the programs of research on human cognitive processes. Continued support should be maintained for efforts that seek to emulate man's own capabilities through the design of problem solving, learning, and pattern recognition machines. It is not inconceivable that some day a physiological theory of learning will be proposed that may lead to the breaking of the input code and the direct input of factual information into human memory.

The Application of Computer Technology to the Improvement of Instruction and Learning

Computer-Based Educational Systems

Six Major Innovations From Instructional Research

A decade ago, a survey of computer applications to curriculum research and applied instructional programs would have produced very little of importance. Today, the online use of the computer in mathematics and science subjects is burgeoning at all levels of education: Elementary, secondary, and college-university. Perhaps more significantly, and in evidence only within the past 5 years, digital and analog computers have become important tools for educational research and development. The computer has facilitated new developments in the following six areas:

1. **Simulating learning environments for instructional purposes and for the improvement of educational administration;**
2. **Automating information and data retrieval sources;**
3. **Assisting in the preparation and evaluation of instructional materials;**
4. **Integrating instructional media (film, tape, TV display, and text) for both group and individual instruction;**
5. **Facilitating the design and study of automated instructional devices; and**
6. **Decentralizing the educational system by bringing remote educational resources into the home, study carrel, and community library.**

What has become the instrument of research today will become a practical instrument for applied programs tomorrow. This will come to pass only if hardware costs and the development of commercially viable time-shared systems become a reality. Time sharing is a fairly recent development in computer programing which enables many individuals to have simultaneous access to a single computer. Less than 6 years ago, if multiple student stations were to be linked into a computer system, it would have cost researchers more than the purchase price of the computer to engineer a multiplexer to tie in these stations. While today these costs run under $10 per student hour for 12 students interacting simultaneously, in 3 to 5 years hundreds of students will study for less than $1 per student hour at teaching stations. The same computer center handling many students can, of course, be servicing the information requests of faculty, administration, or board members, and can be working on class scheduling, payroll, and logistical control problems.

The above cost figures assume that only the usual outlay of funds is necessary to acquire the instructional material to store in the computer. However, it is unfortunately true that few materials for any appreciable segment of courses of instruction are available from commercial sources. What programed instructional materials exist are not adequate for a totally individualized, self-directed course of study. This materials gap needs desperately to be filled. In planning the installation of a computer system, the leadtime and cost of preparing and adapting instructional material for computer-assisted instruction must be given careful consideration. Once the initial investment has been made, however, remote inquiry stations can be used as economical teaching assistants. Furthermore, the pinball effects and the opportunities for exploring subject matter which would be impossible to explore without a digital computer system make these applications essential to educational systems planned for the future.

Because general purpose languages now permit intercomputer compatibility, many schools which have computer facilities could benefit almost immediately from the research and development programs working with computer systems entirely different from those now applied to local school district problems.

Simulation: A New Tool for Education

Introduction

Simulation is sometimes defined as a replication or abstraction of reality. Training a young executive through business gaming techniques and mathematically modeling the queueing characteristics of customers in an airline ticket office are both examples of simulation. The complexity of the simulation can be identified along a continuum from a high-fidelity replication of reality (the Link Flight Trainer) to a complete abstraction of it (mathematical equations representing business operations). The purposes in simulating may be (1) to effect the *analysis* of an ongoing situation and aid in decisionmaking; (2) to facilitate the *development* and *evaluation* of a new design or system or organization; and (3) to *train* students in new and old skills. These three functions of research, development, and training can be carried on independently or concurrently.

Teaching and Training

Computers imitate by symbolically representing real events. For example, radar operators have been trained in simulated radar centers with no antennas, a computer supplying the input to the instruments. Sixth grade history students have been taught by a computer which presented the student with information related to the economic outcome of decisions made when each student was playing the role of king of an ancient city-state. The student was told how much grain had been planted, how many mouths there were to feed, and what the result would be of keeping some proportion of the grain for seed. The student makes his decisions regarding his food production—often with disastrous results. And finally, school administrators have been trained by computers that presented them with imaginary (though realistic) school problems and asked them to solve daily problems of scheduling, budget, allocation of space, modification of curriculum, or public relations.

Computer simulation of any system (that is, any ongoing complex of events) has important advantages over observation of the natural events themselves. Time may be speeded up or slowed down. In comparison with traditional instruction, through lectures and textbooks, simulation offers a sense of immediacy to the learning task and may be considerably more realistic—thereby challenging the student to participate more actively. The student may learn to deal with systems far more complex than any he could learn to describe accurately in the same length of time.

It would seem that anything that can be learned can be simulated (to some degree, with greater or lesser success). As we learn more about how to use computers, possibilities for realistic and varied simulations increase.

As a way of teaching, simulation bears an intimate relation to programed instruction. Much has been written about the advantages of programed instruction. These advantages include intensification of students' attention to the learning task, greater responsiveness to individual needs of students, and freeing the teacher from routines that do not fully use her capacities. Programed instruction is compatible with such new pedagogical ideas as the continuous progress and the ungraded school. Whatever may be said in favor of programed instructional materials may be magnified by the addition of computer simulation. This methodology is a way of turning programed instruction into an artificial environment much richer in information and much more stimulating to the student's desire to participate and learn than any learning situation previously possible.

There would seem to be no inherent obstacles to the application of computer-simulation instruction to any age group from preschool to senior citizen, or to any socioeconomic group from the Harvard business graduate student to the Job Corps trainee.

Games for the Instruction of the Disadvantaged Student (or Why Athletics Are an Unqualified Success in Secondary Schools)

New possibilities for rescuing intellectually and socially underdeveloped persons are evident in artificial instructional environments. The greatest problem is motivation; these nonstudents do not see the immediate relevance of public school education to the lives they expect to lead. They do not know how to relate to teachers, whom they see as judges who will inevitably "put them down." They seek approval not from adults but from their peers, which means, in many cases, from a particular subculture with values largely incompatible with success in the larger social and economic world.

Nevertheless, these young people have motives. They like the approval of their peers; they like to compete in situations where they can win; they like to succeed. They like to talk about and participate in things that seem relevant to their own lives. They like to be in a situation where discipline does not seem to come from outside or from older authorities, or from members of social groups of whom they are suspicious. They like to do what they like to do and not what somebody else wants them to do. In truth, most students, urban or suburban, have similar motives. The problem would seem to be to set up a learning situation in which these motives can be gratified for disadvantaged students to the same degree that they are gratified for a national merit scholar. We should not be surprised that the situations would have to be quite different for the two.

A particular kind of simulation, usually referred to as a "game," promises to go a long way in solving this problem.

In a computer game, the student is presented with information about some situation and asked to make decisions. His decisions are fed back into the system and result in a new set of facts, the consequences of his good or bad decisions, about which he must then make new decisions. Certain random natural events can be made to operate in the environment, causing the game player to consider a variety of factors in his decisionmaking.

In connection with disadvantaged students, games offer the following benefits:

1. They can be made wholly relevant to the lives of the students as the students see their own lives.

2. They can include competition among teams or between individual player and computer to any desired degree, a condition that tends to increase interest to the point of enthusiasm.

3. They are student centered and do not involve direction by an authority figure who might be resented. Direction comes from the computer which is an impersonal machine.

4. The teacher acts as an ally of the student, helping him to play the game so as to have the best chance of winning, just as a football coach is primarily a helper and only secondarily an instructor. Thus, old negative patterns of pupil-teacher interaction may be avoided.

5. Approval is largely or wholly from teammates who are peers.

6. Cooperation is necessary in team play and is a natural consequence of the desire to win. Discipline does not need to be enforced from outside in such a situation. Discipline is learned by having to play by the rules.

7. Appropriate, real rewards, such as money, may be given for success in playing. Some authorities have advocated paying students for learning. In a computer game, determination of how much to pay each student would seem quite fair and objective to the student.

8. The games may take up almost any problem area from those with strictly intellectual of mechanical content to those involving interpersonal relations. One called the family game, developed at Johns Hopkins University, has a great deal in common with family counseling and could have a therapeutic effect on students whose family relationships are disturbed to some degree, as indeed many may be expected to be.

9. A great deal of factual knowledge can be learned while playing the game, as well as from the requirement to marshal one's facts before entering the fray.

In the career game, also developed in the department of social relations at Johns Hopkins University, teams of girls are given information about a fictitious but realistic girl of 17. The players must decide what her life goals shall be, indicating the relative importance to her of marriage, children, an occupation, personal development, and the family standard of living. They then must decide about specific opportunities to fulfill these goals: When and whom to marry, how soon to have a child, how many children, whether to get a job, what kind of job to try for, whether to get additional education, and so on. In making these decisions, the players get help from various resources, ranging from a table showing how much time certain activities take to extensive information about training requirements, competition, and recompense for various occupations.

After each set of decisions, the players get back results indicating how well the woman is doing at achieving her goals and introducing certain events (whose occurrence is based on statistical tables), such as the birth of a child or success or failure at getting a certain job. A game may include 10 decision periods which take the woman to age 50.

Simulation in Training School Administrators

At a very much higher level of ability and educational achievement, computer gaming may be used to train school administrators, as indeed it may be used to train any high-level decisionmaker. A famous example of such high-level training is the Carnegie Institute management game. Simulation studies for training and evaluating educational administrators have been carried out under the sponsorship of the University Council for Educational Administration. Several universities have used films, filmstrips, tapes, and printed materials developed by Drs. Hemphill, Griffiths, and Frederickson for simulating situational tests for researching certain patterns of school administrative behavior. These training tools are not yet computerized. However, by using inbasket techniques, increasing amounts of stress are applied to administrators operating in the simulated environment. Those who experienced the simulated situations felt the simulated materials held promise for evaluating and selecting new school administrators.

Richard Wynn, of the University of Pittsburgh, describes a remarkable change that took place in the preparation of school administrators over the last 4-year period. Into a field of training considered by some authorities to be stagnating, the year 1959 saw the introduction of the first simulated school system. Four years later, 212 out of 289 graduate institutions queried about their superintendent training programs spontaneously mentioned simulation as a relevant method, and at least 65 universities have used simulated materials (in precomputer applications) for training school administrators.

School simulation, which may range from the simulation of individual students to the simulation of whole school districts or, indeed, the total educational facilities of the United States, offers special advantages to experienced professional people in updating their theoretical and practical backgrounds. (There is some reluctance on the part of busy administrators whose jobs provide well-deserved prestige to assume the role of the student and submit to "retreading.") Management or administration games, particularly when mediated by computers, represent a productive application of advanced technology well worth the administrator's time.

Some new and interesting techniques have been developed recently for the training and selection of new teachers and administrators. Dr. Bert Kersh at the Center for Teaching Research of the Oregon State System of Higher Education has reported on a classroom simulation for training student teachers. The student teacher is seated at a desk facing a large rear-projection screen upon which a life-size image is projected. Short film clips present a variety of classroom situations to which the student may react. On the basis of the "acting out" of the student teacher to the filmed stimulus situation, the supervisor of training will select from three projectors a sequence of film which may (1) show the classroom disintegrating as the result of lack of forceful direction on the part of the student teacher; (2) have the students going to their seats but erupting in new problems if the teacher is not vigilant; or (3) result in an effectively managed classroom if the teacher trainee performs adequately. The limitation of this method is determined, of course, by the variety of feedback films that are available for matching the responses of the student teacher. However, a computer-sequenced bank of film cartridges would improve the realism and appropriateness of feedback.

For training or teaching purposes, simulation has the advantage of demonstrating to the decisionmaker or the trainees the advantages and shortcomings of different procedures for meeting objectives. In the simulated environment, the learner can have immediate knowledge of the effect of his actions taken in response to problem situations. This knowledge of results is made possible through rapid data processing by a computer or the judgments of skilled observers. Training in the simulated system environment also prevents a piecemeal approach to the understanding of systems operations, since the training takes place in a total system sufficiently complex to evoke the kinds of problems characteristically encountered in real system operations. Learning can be made more effortless at early stages by eliminating irrelevant cues in the environment. Immediate feedback for the trainee, when he responds to critical cues, helps him to associate cues, responses, and results.

Simulation as an Aid in the Operation of School Systems

It is but a short step from the training of administrators to the use of simulation for the actual operation of school systems.

There is no inherent limit on the amount of factual, valid information about the real world which may be fed into a simulation other than the absence of such factual data. The simulation which begins as a training exercise may grow into an analysis of an actual school system and, through repetitive cycling and correction, may come to serve as an accurate predictor of events in the real system.

This highly valid simulation may be used in two ways: To aid in operating the system as it is, or to try out modifications of the system in simulated form before having to make real policy and fiscal changes. Operation, modification, and scientific study of school systems (or government or management or military systems, for that matter) may be seen potentially to coexist, the lines between them becoming harder to draw.

Besides doing clerical chores in a rapid and errorless manner, computers may provide pictures of new roles for school personnel, modified interactions between teacher and pupil or pupil and pupil, new ways to use school data, better ways to use existing or new space, or characteristics of graduating students (age, homogeneity, degree of achievement, quality of achievement) following modifications of the system. A computer can tell an administrator whether he should buy his own buses or contract for transportation, so as to be in the best position 5 years later.

In the area of administrative decisionmaking, the application of heuristic or Bayesian procedures in support of the decisionmaking functions of the superintendent or school principal should find ready acceptance among educational administrators. Models could be used in the determination of short- and long-term objectives. Choices could be made in the selection of various alternative criteria for approaching the issuance of bonds or the planning of a building program. By storing the subjective biases of school board members or other decisionmakers in the community in a data bank, the superintendent could call upon these biases to set a strategy for floating a bond issue or making other relevant decisions. Alternative choices could be based upon a data bank of standardized information, or if hard data are not available, upon simulation procedures.

Predicting manpower availability by utilizing a skills bank of human capital would enable the administrator to plan for expanding programs. If qualified personnel were not available, or not likely to be available when new courses are introduced, the administrator could develop or support training programs to retread older teachers or prepare new teachers to fill these roles.

The Information Utility or Central Data Bank

An Integrated Data Bank Serving the Needs of the Educator and the Learner

Several research centers are exploring the feasibility of establishing a central data bank or "information utility," as it has been called by some, for servicing all the various needs of subsystems within the educational institution. In an educational system, one integrated data center might serve the needs of the administrator, teacher, counselor, curriculum developer, and student. For instance, in an automated classroom such as at the Center for Instructional Communications, Syracuse University, students carrying on independent study with programed materials leave a detailed record of their learning experience by making multiple-choice answers to frequent diagnostic questions on materials displayed in teaching machines. These records are stored in a central computer facility on magnetic tape. The information thus stored is of interest to the counselor, for it reveals each student's up-to-the-minute learning problems. The curriculum developer has summary data covering the learning experiences of students for specific curriculum evaluation and modification. Teachers have an up-to-the-minute account of each student's level of understanding of the subject matter and the extent of his progress. The school librarian can update the student's information-need profile and guide the teacher in selecting special materials intended to resolve some of the student's learning needs. Rate of progress of the individual learner is of interest to the administrator who may need to monitor and schedule individual study programs in the individualized, nongraded school system environment that the laboratory represents.

Applied Research Programs Utilizing the Data Bank

Project "Talent," as administered by the offices of the American Institute of Research and supported under grants from the U.S. Office of Education, is the first major effort to establish a data bank in the field of education. While this file of data was originally conceived for research uses, it provides an inventory of student abilities and achievements that could help, for example, in the empirical validation of instructional programs. As now projected in the long-range plans for the program, the data bank will be used to aid educators and researchers set standards for educational and psychological measurement, helping to determine the initial state and/or aptitude of the student as the learner enters the instructional program, and to establish measures for better prediction of success through learning. For these purposes, a continuing record of more than 440,000 students will be maintained on magnetic tape for a 20-year period.

The Bureau of Data Processing within the Chicago Public Schools maintains a "Total Information Service" which feeds data into six areas: (1) Budget and finance; (2) personnel and payroll; (3) materials; (4) student accounting and scheduling; (5) research; and (6) computer education. It is this last development that will support the teacher in the classroom through online data displays. Tapping the central information file, instructors have at their fingertips most of the relevant information on their students held in the cumulative record file. Because data are so conveniently available, it is expected that teachers in the Chicago City schools will make productive use of them to acquire a more up-to-date understanding of their students' day-to-day learning needs and cyclical patterns in learning performance.

Some Extrapolations From Information Retrieval Research

The potential range of applications of a central information utility extends well beyond those already mentioned. Through the use of remote consoles, it includes decentralized instructional systems for the home (see the description of the Columbia City Project). Joint utilization of identical data files is possible for research, administrative planning, and student self-instruction, as well as for faculty purposes. Even library and language-lab services can become part of the information utility. Decentralized networks of listening posts for musical and stenographic training are then made feasible. It is not mere speculation to anticipate the day when information acquired during the operation of the central information processing service feeds directly into decision mechanisms that regulate the scheduling and instructional programs of the educational institution.

Extrapolating from the present trends in information retrieval (I.R.), it is possible to envision some of the characteristics of advanced educational systems in the 1970's. Describing futuristic school systems in this manner will serve to point up ongoing research and developments in the I.R. field.

The specialized information center for local school systems will be linked by data transmission lines to regional information centers. These centers translate and select items of information for automatic indexing, abstracting, and coding into magnetic tape files for subsequent feeding to remote school systems. These central archives will gather information from high-utility sources, such as reports of experimental and test results, technical publications, patents, doctoral dissertations, and Government reports. Archives will employ subject matter specialists for locating and weighing the importance of incoming documental materials in specific subject areas. These specialists monitor the input to the computer-based I.R. systems which are optically scanning the contents of the documents selected and converting them to tape. Once converted, the material is translated, abstracted, indexed, and coded for efficient retrieval. Files are constantly updated and purged, with the most significant information in a particular field kept immediately accessible. It should not be forgotten that purging these files is as important as the input to them.

Such information centers will prove efficient and economical by preventing costly duplication in processing of information and purchase of hardware at each and every school system. They will put the major catalogs of the world at the command of the local school library. In addition, they will supply information of interest to the school superintendent and local administration, such as data on economic and population trends, and predictions on the outcome of projected bond issues (perhaps based on past voting behavior of property owners in local school districts).

The evidence for these projections lies in the current trend toward such information centers as the Scientific and Technical Information Facility dealing exclusively in the space and aeronautical sciences. Regional technical report centers in 12 universities across the country have been designated to process, annotate, and convert to machine-readable form all of the research reports sponsored through government contracts. Language translations are now capable of being performed by machine. The I.R. systems established by the National Science Foundation and the Atomic Energy Commission have been disseminating translations of Russian research papers for the past few years. Considerable material from these and other information retrieval centers, such as at Western Reserve University, is already on magnetic tape and could become available to regional information centers.

Such organizations as Bell Telephone, Western Union, Raytheon-Standard Register, and Teletype are experimenting with equipment that will result in computers exchanging memories at great speeds and doing so at relatively little expense.

Weighing procedures for improving the quality of the input to the information center and for purging redundant information from the I.R. files can be seen in the work of Garfield, working with citation indexing methods which build bibliographies and retrieve papers cited in key articles on given subjects; of Hayes, conducting research on self-organizing files which arrange materials in terms of frequency of use; and of Kellogg, working on fact retrieval where duplicate data can be purged or old facts can be eliminated when new data are available, thus gaining a considerable increase in the machine's storage capacities.

The school or university of the 1970's will have a dynamic system of information retrieval serving the entire school system. Instead of a passive cumulative record file and libraries waiting for customer requests, the I.R. system of the future school will direct information to a person "who has not yet asked a question but does have a need for the answer." As an example, the dynamic I.R. system would index the content of a new document and mathematically select customers whose interest or information-need profiles indicate that the content would be of some relevance to them. Automatic dissemination would then result. Feedback from the customer, i.e., the student or educator, would continually update the store of profiles of potential users. Student-learning performance would also cause changes in these profiles, for as students progress through new subject material, both information needs and interests would evolve.

The use of the school's information utility, as described above, by both the educated and the educator, allows some predictions for information systems application of stored information:

a. The student

Computer-based independent study cubicles will line the halls of the advanced school system in the early 1970's. These study areas will combine information retrieval and automated teaching equipment to give the individual student aid in compiling bibliographies and recovering facts for the preparation of essays, and assistance in reading text material by supplying outlines or arranging content in graded levels of difficulty. For learning purposes, the I.R. teaching machine would arrange graded sequences of computer-constructed instructional items and occasionally would seed in a diagnostic test to test the student's understanding. This teaching machine system would have the potential for handling individual student differences in learning rate, background, and aptitude. Sequences of educational material would be retrieved and organized on the basis of the student's response to the diagnostic questions as he is learning and on his specific learning abilities and aptitudes.

Recognizing that most students come to their studies in different states of ignorance, the I.R. teaching machine would help a student redefine his area of concern. The student might write a short essay detailing what he thinks is descriptive of the information he wants. The essay would then be handled in the fashion of an automated abstract and the words selected from the essay would be compared with words similarly selected from the documents or facts stored. The teaching machine would encourage the student to explore new but related areas of knowledge, to browse through updated information, and to search for alternate solutions to problems.

b. The teacher, researcher, and counselor

The same equipment used by the student for self-instruction can be utilized by the teacher for research purposes or for updating himself in subject matter. Rapid changes in academic subjects can cause considerable information lag in the resource books used by teachers. The computer-based I.R. system will help the teacher in assembling programed instructional material and serve as a source of current information and necessary data for upgrading an outdated curriculum.

For classroom management purposes, the teacher will have displayed, in the classroom, certain diagnostic information in an interpreted form to help him individualize his instruction. To deal with early-in-the-semester classroom grouping problems, the teacher can retrieve student information with suggested groupings of students along many different dimensions.

The counselor in this advanced school system will use I.R. storage and retrieval capabilities for doing a more efficient job of counseling. Using I.R. files for counseling purposes involves the storage of all student personnel records on magnetic tape. If these records include aptitude test scores, family background information, or student's past grade record, as well as his current record of progress, the counselor will have at his disposal all the appropriate information he needs. As the stored information is continually updated by the daily progress of each student through the course material, the counselor will have the capability of monitoring the progress of any one student and of applying preventive measures before a student has developed a serious educational problem.

Researchers at Stanford University and Carnegie Institute of Technology are exploring the advantages of simulating a counselor's or teacher's diagnostic behavior for purposes of guiding the student through his educational program. By automated interview programs, students review their progress and are helped to plan a schedule of high school courses.

A student tracking system that follows student progress and provides displays to students, teachers, and counselors when the student's performance falls below expected levels will be integrated into a total system. The system will be further enlarged to include numerous other functions, such as diagnostic interviewing and testing, computer-assisted instruction, and real-time, flexible scheduling and control programs that solve scheduling problems on a continuous basis.

The Automated Production and Evaluation of Educational Materials

Tailoring Instructional Materials by Closing the Feedback Loop Between Student, Teacher, and Textbook Writer

A behavioral engineering approach to improving instructional materials has been the object of extensive research conducted over the past 2 years at the System Development Corp., and more recently by the Brooks Foundation within the Philadelphia school district. Partially supported by the U.S. Office of Education, researchers have been using a technique of individual tutoring to modify and revise instructional materials, including standard textbooks, programed instructional sequences, film and filmstrips, flannel board cutouts, and the like. Significantly improved learning for urban-area students has resulted when work is completed with these modified instructional packages. This improvement has been remarkably evident among students with substandard verbal backgrounds or among learners primarily of a visual orientation.

The method of approach, that is, the behavioral engineering technique, is basically simple. It depends primarily upon a systematic analysis of student learning behavior for the testing and revision of the commercially available text or instructional package. In each subject area, the material is given to one or two students at a time. If the student has difficulty with the learning task, he is interviewed immediately to ascertain the cause of his difficulty. All of the interactions are verbally recorded, and when the student resolves his difficulty, the experimenter/tutor notes the program variation that has been most effective. This procedure is repeated with other sets of naive students until the modifications take care of most of the typical learning problems that the students can generate.

A Data Bank on Effective Instructional Strategies

The computer is used in the collection and analysis of student responses to diagnostic test items during the process of tutorial instruction. Areas for revision are identified by this process of analysis.

The program of research at the Brooks Foundation will eventually lead to the establishment of a data bank of information on the different learning problems students encounter at different points in the instructional program. Typical problems will be identified and related to the effectiveness of different strategies developed to resolve them. The result will be the eventual storing of multiple-media routines of individual instructional programs following the pattern of the most successful instructional strategies. This library of material will be stored within the school district's central data bank and will be brought to the classroom, the independent study carrel, or the faculty office at the time when it is needed—either by the teacher or student or by the curriculum developer.

Natural language data processing will be used in Philadelphia as the means for building the data bank. Questions students have raised (and which have been tape scripted) are converted word for word into machine-readable magnetic tape. The computer program automatically indexes the questions, essentially by building a concordance of the content words, and cross-references them with the text being studied. That is, words used in questions revealing student difficulties are maintained with a numerical listing of each chapter, page, paragraph, and sentence read at the time the problem occurred. Successful strategies for modifying these passages that have been developed with other students of similar IQ, background, and difficulties in identical tutorial sessions are then identified from hierarchical listings. As now planned, the ultimate operational system would include simultaneous inputs from many high schools in the city.

The significance of the research just described and the particular application of the projected computer-mediated materials bank has a good deal of import for the textbook publishing industry. The research accomplished to date seems to point to the existence of half a dozen or so basic learning problems which are common to most students involved in a particular unit of study. Through engineering their instructional sequences or extracting from the data bank of prestored information, most textbook writers will be able to identify these problems and prepare instructional sequences that resolve them. A "textbook," or individualized instructional package resulting from this process could be defined, then, as an amalgamation of film clips, manipulated objects, branching or scrambled programed texts, workbooks, cathode ray tube displays, and different textual materials. Packages could take a deductive, an inductive, a pictorial, or a verbal approach to the explanation of subject material. It will be the task of the educational engineer (and the instructor) to identify the patterns and typical problems of learning, and it should be the responsibility of the publishers of instructional packages to reflect these patterns and problems in their materials. Otherwise the use of the computer and its vast resources for data collection and analysis, as well as the power of computer systems to provide for materials and instructional routines to the schools, may be wasted.

Another and more directly computer-aided approach to the generation of text can be found in the work of researchers using the computer as a tool for instructional research. In general, the computer-based instructional systems aid authors in preparing, evaluating, and modifying texts with comparative ease. For computer-assisted instruction, authors are writing and testing material in the following areas: Remedial reading, German, French, accounting, economics, history, current events, psychology, educational psychology, physics, engineering, audiology, statistics, calculus, logic, modern mathematics, medical diagnosis, nursing, computer programing, typing, and bird identification. (See Zinn's listing of instructional programs.) Some of the materials are in the format of linear and scrambled textbooks, often little more than a computer-scored quiz. Others are in the "discovery" (inquiry) or simulated game pattern. Coverage within each field is not complete. (It would be impossible to put together a curriculum from what is now written for computer instruction.)

The materials being generated by researchers at the Universities of Illinois, Michigan, Penn State, et al., are entered into the computer through the use of simplified codes operated for the most part with natural language inputs. (See the description by Zinn in his paper, which follows, on Specifications of Computer-Aided Instruction.) With the risk of duplicating what Zinn covers so thoroughly, let us stress the importance of this development by summarizing his remarks here.

The computer is used in this materials production process basically in five ways:

1. Aiding the author in inserting instructional materials into the computer library file by permitting the use of natural language inputs, obviating the need for knowledge of machine language.
2. Editing facilities which permit automatic hyphenation, pagination, and alteration of text material.
3. Providing for automatic diagnosis of the author's errors or weak passages in the sequence of instruction, identifying internal inconsistencies and omissions in the light of criteria and diagnostic test performance of learners.
4. Syntactical and structural analysis of the author's material, e.g., identification of terms used before they are defined, frequency of examples, and introduction of key concepts with familiar terms.
5. Access by the author to a library of instructional strategies tested by experienced faculty in the classroom (as extrapolated from the data bank), and a file of unusual responses or questions students have raised while involved with self-instruction via the CAI system.

Apart from the work of researchers concerned with CAI systems, others have achieved results which presage an era of fully automated production of sequences of instructional material. These developments have run the gamut from subroutines which produce example items such as might be appropriate for drill in addition and subtraction or spelling, to the generation of natural text answers to questions in English. The latter has been more closely identified with work in information storage and retrieval (I.R.), but it is represented here as a possible resource for the automatic production of study materials for instruction. The (I.R.) system called "baseball," devised by Green and others at Carnegie Institute of Technology (1961), allows an inquirer to present natural text questions about the history of baseball to the system. In the computer program, the history of baseball is stored as lists which are manipulated by means of an information processing language; the International Programing Language (IPL-V) system answers are computer generated in the English language.

At SDC, the Synthex Project has been working toward techniques for processing pictures into verbal descriptions. In the reverse direction, computer generation of nonverbal materials (sounds, graphs, pictures, structured tables, etc.) from verbal or numerical inputs may better serve the individual who is not verbally oriented or who is working in subject areas that are visually oriented. For example, as conducted in two special classrooms at MIT, the student can apply mathematical formulations to highway design problems and then visually assess the adequacy of his work by computer-generated graphical representations of various stress factors and their effects. Licklider describes the Bolt, Beranek, and Newman PDP-1 system which permits the student to type in the coefficients of an equation, with the computer immediately displaying on the TV screen a corresponding parabola. By allowing the student to vary the coefficients in different ways, the computer-generated instructional sequence can help him understand the relations between the coefficients. A further example of this kind of multidimensional display is seen in the work of Dr. Richard Wing of the Board of Cooperative Educational Services (BOCES) Center in Yorktown Heights, N.Y. Here, the IBM-7090 is programed to sequence a series of color slides on the basis of student instruction during a simulated experiment in chemical analysis. This means that a chemistry student can sit at his desk and type directions to a machine that will "perform" chemical experiments step by step. The student has a viewer on his desk which shows him what happens if, for instance, he orders potassium chromate to be added to a solution of hydrochloric acid. If the solution turns yellow, or the mixing causes an explosion, the student sees this on his viewer. Thus, the computer simulates what would happen if the experiment were done in the laboratory.

Group Instructional Technology—Computer Monitored

Elementary and secondary school administrators, as well as their college equivalents, are seeking (1) to alleviate the pressure of student numbers, and (2) to unburden the student learner from the restrictions of pace and time. These two trends, distinctly discernible in technological education, lead in opposite directions. The first seeks to reach larger groups with fewer teachers (and at the same time provide "quality" instruction through more effective communications). The second is aimed at individualizing the instructional program, with the single student working independently at his own pace.

The economic advantages of group training are, of course, self-evident. Not so obvious are the potential advantages that can be derived from the social-facilitating effects of large group instruction. Some of these advantages are:

1. Improved learning through group reinforcement and competition.
2. Improved learning through student interaction (e.g., prompting and simulation).
3. Increased efficiency through group resolution in the problem-solving situation.

At the Newhouse Communications Center, Syracuse University, several large classrooms are equipped with individual response keyboards at each student desk. These keyboard units are tied to a readout display at the instructor's desk and will eventually be linked to the computer center. According to Dr. E. Oxhandler, associate director of the center, instructors working in these classrooms have devised various ways of utilizing the summary data of student responses. One professor has his students respond a "yea" or "nay" judgment on an answer to a specific problem given by a student. The student responses are automatically totaled and written on the blackboard. If it is "thumbs down," then the student who gave the answer must support his position or alter his response.

Another professor has used summaries and readouts of student responses to improve his lecture material. At appropriate junctures, diagnostic questions are seeded in and student responses are elicited. He then modifies his lecture notes according to the answer most frequently given by his class. A third classroom will be wired with a unique special keyboarded typewriter unit at each station enabling students to make abbreviated transcripts of the lecture material. When these units are linked with the computer center, they will provide an evaluation of the students' understanding of the material presented in the lecture. This application is a good example of the information that can be gained from computer monitoring of learning and recording devices, either on or off line to the computer system. Data collected in this fashion can serve a variety of research and curriculum development purposes.

Chicago Teachers College North has fitted an 800-seat auditorium with a four-key response unit at each seat tied to a central computer. Real-time displays to the instructor and branching based upon a group mean of responses will determine the sequence of audiovisual presentations to the large mass of students.

This brief summary of the more advanced computer-based, group instructional technology is designed to close the feedback loop between student and teacher. Group instruction technology can also provide:

1. A means for controlling student attentive and imitative behavior by requiring the student to respond actively to lecture material.
2. Immediate feedback and reinforcement schedules to establish effectively desired changes in the student's behavior.
3. A step-by-step analysis of the teacher's educational material and its instructional effectiveness.
4. A wide range of media presentations and alternative approaches to the same instructional goals. Variable routes to the instructional program are prepared to insure that the subject is viewed from a number of vantage points and is taught in a way amenable to the variety of needs by a heterogeneous learning population.

The classroom of tomorrow will not eschew the conventional teaching methods of discussion, lecture, and textbooks (though new and different textbooks will be needed). But it will make wider use of different media, including television, films and slides, and the computer. Visualizing the future applications of computer technology to increasing teacher efficiency and effectiveness in the classroom, the computer-based classroom will provide for a variety of bookkeeping and diagnostic functions. According to some educators, the teacher spends at least a third of his time not teaching. He acts as host, clerk, librarian, counselor, housekeeper, decorator, ticket seller, attendance taker, data processor, analyzer, and policeman. Many of these noninstructional functions and activities will be automated in the computer-assisted classroom. For example, when the teacher has a console in his classroom linked to the school computers, attendance taking will be even simpler when he need merely punch the key of each absent student.

One of the paramount problems in classroom instruction is to coordinate learning activities among a group of students of heterogeneous abilities and educational backgrounds. If we look closely at the good instructor practicing his art, we find him individually tutoring students, helping to resolve individual learning problems; we find him making expedient use of the social and motivational benefits of group instruction; and finally, we find him appropriately adapting curricular materials for both individual and group modes of learning. The computer-based classroom fitted with television display devices provides the teacher a means to monitor student progress individually; it also provides a readily available display of relevant educational data on subgroupings of students in the classroom. Conceivably it could also provide automatic alarms to alert the teacher to students heading for trouble, hopefully in sufficient time to prescribe corrective procedures.

Specifications for Computer-Aided Individualized Instruction Systems

by Karl L. Zinn[1]

There has been and there will continue to be much debate about the value of computers as teaching machines. One major question is that of economy: Will computer systems be too costly to establish and maintain and too unreliable in their operation to be used for regular instruction? Arguments in favor of computers have been given but the problem must be explored with large investments in careful field-testing of computer-aided instruction via time shared, remote processing systems. Other questions concern the quality of the tutorial instruction delivered by a computer. For example, can the machine adapt well enough to the individual student? Interaction between student and automated instructional machines does hold great promise. In comparison with the present crowded classroom situation, the computer might even today show tremendous advantage for the individual student. Few students receive the individual attention which even a mediocre sequence of instruction can provide via computer. Although the first investment must be made in self-instructional material regardless of mode of presentation, a sophisticated self-instruction device will be required to test the proposed advantages such as machine-processing of constructed responses and adapting of materials to student characteristics and current performance.

The immediate justification for computer systems today comes not in the instruction value but in the research and development payoffs. For example, an electronic processor can make extremely complex and adaptive presentations to student subjects under well-controlled conditions. Such facility promises to help bridge the gap between somewhat artificial or contrived laboratory situations and actual application of learning principles in the classroom. Laboratory results obtained under highly controlled conditions may be contradicted later in the natural setting when previously controlled factors are allowed to influence the student subject. A computer system allows better representation of the real world under conditions of laboratory control and measurement.

Research and development also require a computer for extensive data collection and summary of long-term individual performance records. This data collection would result in mountains of paper exhausting armies of researchers if the machine did not also carry out summarization. The selection of appropriate techniques of data reduction is important for each research or development purpose. For example, the empirical revision of instructional materials is a very expensive and time-consuming procedure because of the amount of data on individual student performance which must be considered. An "intelligent" computer routine would monitor many aspects of student performance and would summarize them for the author on request. For example, the machine might accumulate all unanticipated student responses and questions. If there is a large number, the machine should attempt some classification and display a listing or diagram for the author's perusal. The author could request greater detail whenever the summarization was not clear. Other examples are discussed under sections B, E, and F below.

Another important advantage is the ease of experimental treatments allowed by computer control. Once the experimenter has clearly specified the alternative instructional strategies he wishes to test, that is, specified them so they can be programed on a computer, the relevant parameters can be varied automatically according to the design selected. Furthermore, greater efficiency with research data is achieved by adapting the design to the performance of the individual student. This has been demonstrated by Smith in psychophysical experimentation.

Developing a Computer-Aided System for Instruction and Research in Learning Processes

Six tasks to be approached in developing a computer-aided system for instruction and research on instruction are discussed below. Each line in the diagram is represented as a one-way arrow; however, the channels should be two-way interactions. Interdependence of communication is labeled in parentheses and brought out in the discussions.

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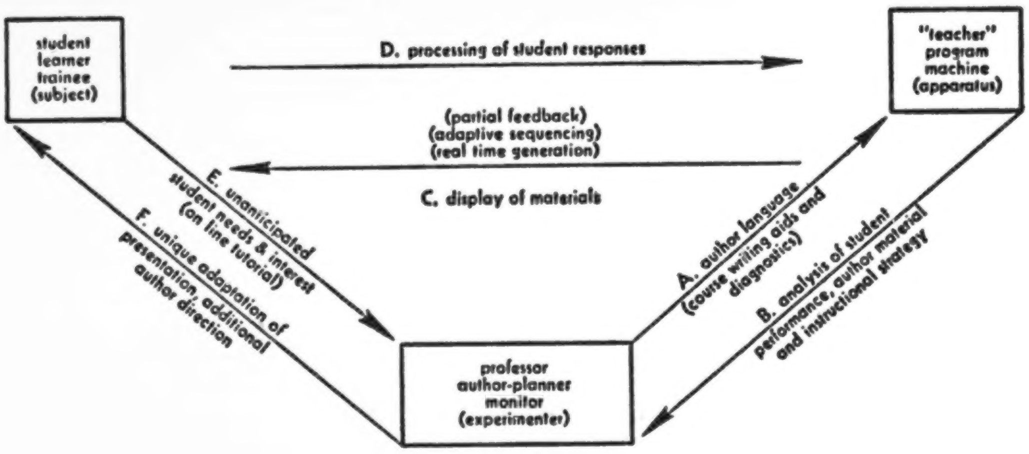
[1] This material is included here by permission of the author, who is at the Center for Research on Learning and Teaching, University of Michigan. It was prepared for the *Automated Education Handbook*, published by American Data Processing, Inc.


student
learner
trainee
(subject)
D. processing of student responses
"teacher"
program
machine
(apparatus)
(partial feedback)
(adaptive sequencing)
(real time generation)
C. display of materials
E. unanticipated student needs & interest (on line tutorial)
F. unique adaptation of presentation, additional author direction
A. author language (course writing aids and diagnostics)
B. analysis of student performance, author material and instructional strategy
professor
author-planner
monitor
(experimenter)

Task A: An Author Language for Instructing the Machine With Regard to Teaching Strategies and Materials

A current bottleneck in computer-aided research is the programing of the computer to carry out the operations intended by the experimenter. This technological gap is even more restrictive in computer instruction since the professor-author is less likely to have the computer programing skills or the programing assistant available to interpret his instructions to the computer. Certainly the user in such a system should be able to write in his own language with a minimum of restrictions the self-instruction or research materials he plans to use. This computer language should include general and special vocabularies natural to the author for describing his instructional materials and strategies. Presumbably, the user's approach will employ the computer logic to treat students or subjects differentially, and it should be easy for him to so specify via a set of logics or strategies with which he is comfortable. A proposal for a system of training patterns to be available in such an author language is given in another paper. An important aid for the use of this author language is an editing facility with which one can modify with ease both the material and the strategy stored in the computer.

An essential characteristic of this language is that it be user-oriented without denying the author-instructor access to any of the system capabilities. For example, the novice will be able to prepare materials for computer instruction after only minutes of explanation of the system language, and the experienced author will be able to use the capabilities of the computer to the fullest for as complex a procedure as he can construct. In the evolution of such a system a computer programer works with the authors to implement each new request for system capability, but it is his purpose to program himself out of the system by generalizing each function which might be used a second time.

At the first stage of development, the language includes alternative modal conventions such as printing an "X" after each student response which is wrong, or selecting material with regard to the match of student and frame characteristics. A number of such modes or basic patterns are available on request, some for author purposes, others for experimenter specifications. A library of special functions or procedures should also be available and expanded as needed for carrying out other particular tasks such as "display the frequency diagram," "generate a type III syllogism with neutral terms," and "repeat list to criterion." Finally, it should be an easy matter for the user to define his own frequently used routines in terms of those already available so he can call on them with a single statement.

For long-term development, the compiler system must be flexible and easily modified to incorporate increasing user-specified requirements and to carry out research on new tutoring strategies and hardware. In the early stages the input/output equipment might consist only of a typewriter or teleprinter station with supplementary visual and audio files. Eventually it includes computer-generated display apparatus and perhaps special responder units developed for the needs of particular research and instruction. The software will be expanded to process a larger and more flexible author vocabulary, incorporating developments in natural language processing and inquiry techniques.

Descriptions of three examples of author input language are available. In brief, it is an interpreter language of about 12 executable instructions or operation codes and 10 manipulative commands by which an author at an IBM 1050 terminal enters and edits text material and branching logic in the disc storage of an IBM 1401, 1440, or 1460 system. In execution with a student at the 1050 terminal, the stored instructions are interpreted to present reading assignments, questions, and replies to student answers. Responses constructed by the student are typed on the keyboard, entered into the computer for comparison with alternatives previously stored by the author, and the next computer reply is determined by the answer with which a match is established. Some trivial characters, such as space and tabulation, can be edited out to better achieve a match. The 1050 teaching stations have the potential of control of accessory delivery hardware, such as random access visual and audio files. The system has the capability to accumulate and summarize data on student performance and frame characteristics for the author-experimenter. A limited records facility has already been announced. The instruction list can be extended by the addition of functions written in autocoder.

A second example is the work of Leonard Uhr at the University of Michigan. His approach is similar to Coursewriter but imposes fewer restraints on the user in writing his text, questions, and alternative answers. In addition, Uhr includes a processing function which accepts partial, synonymous, and loosely stated answers. The programs written in SNOBOL are being tested on the Massachusetts Institute of Technology MAC system.

The PLATO group at the Coordinated Science Laboratory, University of Illinois, have developed a language for writing teaching logics or patterns for their system. It is used in conjunction with their CDC 1604 assembly language and a modified FORTRAN. The programer has great flexibility and scope for preparation of basic patterns (such as tutorial, inquiry, and simulation) into which any author can later insert his particular teaching material. For example, an author need write only the text, right answers, and diagnostics for tutorial instruction; the computer has been programed in advance to fit arbitrary text and answers into a tutorial dialogue. In another preprogramed strategy the author may insert any text which he wishes to evaluate; the computer collects data during presentation to students. A third type of strategy being explored is simulation of laboratory or real world situations, such as qualitative analysis, medical diagnosis, international relations, or a primitive society. Researchers at Bolt, Beranek, and Newman are giving particular attention to a system in which an author-instructor can implement training and testing of diagnostic skills.

Computer instruction systems will provide author facility at three levels. The first has been described, in which the author enters only his text and rules for evaluating answers in some standard pattern of instruction (e.g., a PLATO teaching logic). No knowledge of computers is required. The second level allows the author to specify his particular pattern of instruction in a relatively simple language which can be learned in a short time (e.g., the IBM author language). At a third level an author having some training in computer programing writes out his own routines and strategies, and he has access to the full capability of the computer system. However, the important point is that computers should be programed to carry out instructions written by an author in his own language. The exactness and organization required of the author should be no greater than for preparation of effective self-instruction materials which do not use a computer.

Course writing aids and diagnostics. There are a number of ways which computer routines can assist the author in the preparation and revision of his course. First, the system can instruct authors in the use of the language, via examples and exercises. This is especially important if the language is continually being extended. Part of this instruction would be accomplished via a retrieval system covering the reference manual for the author language. It would answer such questions as what functions have been added to the language since this author last asked for new functions, or which of alternative sequences of instructions will require the least execution time. Second, the author will be able to compose and edit text and diagrams on a CRT using typewriter and light pen. The commands to delete, insert, change, and move can be applied to any size segment from a single character to a lengthy concept drill represented by a symbolic name in a block diagram on the CRT. Third, the system can provide diagnostics on probable errors in a particular course such as internal inconsistencies and omissions in the sequence of instructions, and suggestions or reminders of how to take full advantage of the computer system. This action might be cued automatically by the presence of a particular pattern of instruction which is incomplete, unusual, or equivalent in function to a simpler pattern or set of instructions. Or this information may be obtained by requesting, for example, which branches in the teaching system have been specified but not provided for. A fourth author aid is the syntactic and structural analysis of his own material. An author might make good use of the results of searches of his own text for uses of terms before their definition, frequency of examples for key concepts, spacing of the introduction of new concepts, and so forth.

Task B: Analysis of Student Performance, Author Material, and Instructional Strategy

The immediate summarization of student performance is very important to an author-instructor for both course development and individualized instruction. These data are best obtained with one observer for every student, but this arrangement is costly in both time and money. Instruction programers have in most cases settled for tedious tabulation of written responses of students obtained under poorly controlled conditions. The computer system makes possible proper data collection and summarization in real time interaction with the student-subject. First, the responses are obtained under well-controlled conditions; the author knows exactly what material the student has seen and when. Second, additional data, such as response latencies and trace of choices, are available for interpretation. Third, and in some ways most important, the online processing of student responses allows real time program modifications. That is, a "monitor" may be provided to execute prearranged changes on the basis of student performance summaries.

The instructor needs summary data on individual student performance for day-to-day scheduling of learning materials. The author needs frame-by-frame and strategy or pattern analysis for continual revision of a program in the development stage. Student error rate and frame difficulty have been used, but in the adaptive real-time, computer-based system statistical treatment can and should become more sophisticated. New developments in data reduction for indefinite sequences, trends, and patterns may be employed, and Bayesian statistics are appropriate for processing partial data subject to later revision. The contributions of Smallwood and Karush have been important in regard to online processing, but simpler algorithms or perhaps heuristic techniques have to be derived which reduce only the most relevant information. In the interim the selection of decision logic and technique of data summarization can be left to the author-experimenter. After an author obtains a summary of overall performance, he may wish to inspect certain records in more detail. Graphic display of data will facilitate efficient retrieval at an appropriate level of detail.

Task C: Display of Instructional or Experimental Materials

Much of computer instruction to date has been restricted to typewriter input and output. Notable exceptions to text mode have employed taped messages, computer generated sounds, and transparencies or computer generated diagrams projected on a television screen or CRT. The important point is that the author not be limited in his controlled presentation of material to students: Input should be natural and efficient. Inexpensive displays on paper, film, and tape will serve for much computer instruction. Some important features of a more elaborate display facility under control of the central system are discussed after task D.

Task D: Processing of Student Responses

The computer provides a "comparator" function which may be quite important when the learner does not have adequate discriminations at the beginning of his study. Often it is too difficult or distracting for the student to compare his own response with the standard or alternatives provided by the author. The computer not only can make this comparison but also can be programed to give detailed feedback in regard to the discrepancy between response and standard. Input by the student may be characters on a typewriter or special purpose keyset, graphic indications with a light pen or some other pointing and indicating control device, or audible sounds made vocally or with some device such as a musical instrument.

In character input, trivial differences in spacing, punctuation, spelling, format, word choice, and sometimes order and number of words should be allowed in answer matching when so specified by the author. One of the functions of the input language is to allow an author-experimenter this control without increasing the complexity of the language for another user whose needs are met by one type of answer-matching. Eventually routines will have some of the characteristics of natural language processing, i.e., the machine will, in some limited sense, "understand" a student answer or request. Processing of mathematical and other symbolic expressions input by the student requires another set of routines which will let pass trivial differences. In general, a symbolic interpreter is required to allow any equivalent expression where the author so designates.

An interesting example of response processing is the encoding of speech or music for comparison with a standard or model available on tape. The delivery device plays the model recording of the word, phrase, or musical phrase, and asks the student to match it. As he makes his response, the wave shape of his audible response is compared on one or more selected dimensions with a replay of the standard, and the mismatch is displayed immediately as feedback to the student. Thus, when he is trying to play the first three notes of a major scale to agree in pitch with the standard, he sees immediately the direction and extent of his error. In attempting a Spanish phrase the student might set the comparison dimension for tempo and note at which points he is producing the syllables too rapidly or too slowly. Buiten and Lane at the University of Michigan have developed an analogue and digital system for research on the prosodic characteristics of speech.

The capability of speech recognition with a very limited vocabulary may be available in experimental instruction systems in the near future, and vocal input of a general nature is likely to become eventually a common component of computer systems.

Another kind of response processing is the computer verification of student solutions. For example, if an intermediate level student is attempting to prove a theorem in logic he should not be required to write out in detail every step necessary to the proof. When he makes a small intuitive step, as mathematicians frequently do, the computer checks for validity by carrying out the necessary steps in detail. This has interesting possibilities for instruction since a computer doing the processing task can also be programed to accumulate the kinds of errors which the student makes, and generate additional exercises to assure acquisition of the skill.

Partial feedback on a student answer is an interesting and important concomitant of answer-matching. That is, the computer is programed to print out those parts of the answer which agree with the model provided by the professor. The feedback is typed out immediately below the student's response so he can compare and consider differences before making his next attempt. Uhr has programed this feature with the provision for specifying order in the elements of an answer. For example, an author can ask a student (via the computer program) for a list of examples; the processing routine searches for the keywords of each example in order (accepting the examples in any order) and prints out in the author's words those examples which the student apparently entered. The author could choose an alternative logic and print out those answer elements which were not included in a student reply. Response processing and partial feedback reduce the task of the author and increase the interaction between student and instructional program.

Adaptive sequencing. In a programed textbook off the shelf, the student's pace and branching are based on only the current response. To achieve more than minor adjustment to individual differences, the instructor must maintain a library of parallel programs following different tracks and direct each student to the proper one on the basis of continual review of performance. A computer-based system makes possible a number of much more sophisticated adaptations which incorporate frame difficulty, frame relevance, student error rate, response latency, IQ, interests, etc. When the author can provide a number of alternative frames or a rule for generating a frame at any point in the program, selection from a set of frames is determined by any one or a combination of frame and student parameters. In mathematics instruction, a set of frames might include alternatives at varying levels of difficulty or perhaps based on applications drawn from different subject areas. The important dimensions in such adaptive selection or generation are not well known, but a system having such capability is necessary for research on these parameters.

Real time generation. There are two practical reasons for preparing computer programs which generate instructional programs from the content elements and relationships provided by a subject expert. First, there are instances where it is more efficient for the computer to generate exercises in the subject, such as arithmetic, logic, or spelling, than to store all the possibilities intact. In programing a sequence to drill addition or multiplication facts, the programer certainly would not store all combinations but only the digits and the operators, and generate the exercises from them. The author would, rather, describe a class of problems than write out each problem of the class in detail.

Second, if our best theories or intuitions are any better than random guesses, the generation of material can be adaptive in a way which facilitates learning. For example, one might provide a generation rule which results in more practice for certain number combinations difficult to master. A rule which incorporates current student performance parameters would emphasize those combinations which are difficult for the student who is presently receiving training. In the development of reasoning skills or logical analysis, one might generate a variety of syllogistic reasoning problems, first using symbols, then nonsense terms, and finally meaningful material. In paradigms where the student's performance suggests lack of mastery, additional exercises would be provided at the same or a simpler level until the student demonstrated he could proceed further. Spelling is another subject in which storage of a dictionary of words and likely connections among them would provide a more efficient and powerful way of presenting exercises.

Another adaptive function which should not be overlooked is a diagnostic *testing* procedure by which not all test items need be given to all students. For example, a difficult item in the application of a principle would be given only to students who could identify the principle. Others would be tested instead on knowledge and use of knowledge in other areas. In this way each student can be led to the depth as well as the breadth of his knowledge in a reasonable length of time. It has been suggested that this method of testing also leads to greater learning on the part of the student because he prepares more carefully and continues learning in the testing situation. This mixing of learning and evaluation will become increasingly common in college instruction. As a result the student will always know how well he is doing and where he needs additional study, and the teacher will know where the instructional materials are not meeting his objectives.

Task E: Unanticipated student needs and interests

Task F: Unique adaptions and additional direction

These channels are important considerations in a sophisticated author-program-student system. What today is unanticipated and unique should, by tomorrow, become part of a more detailed and comprehensive program of instruction. An author must exploit the valuable data screened from these channels. However, tomorrow there are new needs which require that these channels be kept open. It is expected that there always is a human monitor in the system with the learner; he can be called upon when needed, and he can interrupt when he feels it to be appropriate. These channels are more completely realized in the conference room with tutorial and group discussions where they should be of central importance.

In the automated system described in this paper, an interrupt feature allows direct communication to be initiated from either direction or by a condition of the system related to student performance. The machine maintains a record of the performance of individual students for guidance as well as research and curriculum evaluation purposes. Certainly the student should be able to ask for help at any time, and the tutor responding should have the benefit of an immediate summary of current performance and a list of possible difficulties. Furthermore, the supervising tutor should be able to scan such summary without the student having to ask for help or additional direction. Sometimes he might, on his own initiative or an alert call from the system, interrupt and help a student around an approaching difficulty, or might introduce some additional guidance that would provide an interesting new direction for study. These aids not anticipated by the author should be noted and incorporated in revision of the instructional material and strategy. The system should provide for author modifications in previously written material while monitoring a student's progress through instruction.

On-line tutorial. The machine also could monitor the individual interchange between students and author-instructor for the purpose of improving the program. The record could be used much as tape recordings of tutorial sessions. However, since the communication is stored via electronic media, further summarization can be carried out by a computer. Ideally, the editor function of the compiler should be able to store away and later use what a professor adds to his course when interacting "online" with a student who is going through the preplanned sequence at a different terminal. In system description this is a routing of channels E and F (student-author interaction) through the program element so they can be monitored and processed for use in later student-program interaction, in revision of the materials, or in research on behavior of author and student in a tutorial situation.

The Third Generation Computer—Time-Sharing With Many Simultaneous Users

Introduction

Since 1955, three major stages in the application of computer technology to education have been evident. The installation of the university computing center for the solution of mathematical and scientific problems came first. The second stage was the use of electronic data processing (EDP) systems in accounting, recordkeeping, and logistical control activities; this amounts to the automation of information and data processing systems. The third stage, now barely underway, involves the use of time-shared computers with on-line teletypes and cathode ray tube (CRT) display equipment for supporting educators and learners in a wide range of intellectual processes. It is this third application that spells a revolution in American education, primarily because the development of time-shared systems promises to improve instructional processes.

It would be difficult to overestimate the full potential of large-scale, time-shared networks of inquiry stations for the improvement of learning. Computer-assisted instruction and the use of inquiry stations to teach computer mathematics and programing as they apply to certain academic and vocational subjects are examples of the potentially fruitful applications in this new generation of computer systems. These two rapidly growing areas of development have received much publicity of late, and justifiably so, but the impact of computer technology on the improvement of environments for learning is by no means limited to these.

The Columbia City Project—A Time-Shared Network of Computer Stations in the Home

A new dimension will be added to home television viewing if projected plans for a computer-based communications center come to fruition in Columbia City, Md. Research is underway to develop in the new urban community near Washington, D.C., a coaxial cable network, similar to community antenna systems now serving many communities, that will tie more than 10,000 homes into a single community computer center. The homes in Columbia City will have a two-way communications capability to be used for adult education, commercial, and recreational purposes.

Linking a home to a community computer center puts the services of a large digital computer "oncall" for each member of the family. Current applications of the computer then become possible in the home from the playing of games with other TV viewers to the retrieval of stored facts and documents for the individual learner. All of this is within the present state of the electronic art of computing systems, but the various elements of the system that now exist need to be pulled together into a working prototype.

The Maryland State Department of Education is designing the system for its educational applications and plans are now projected for installation of the first neighborhood center in September 1967.

A small keyboard device linking the viewer by coaxial cable and telephone line to the computer center makes the system possible by adding a feedback loop to television viewing and making the observer an active participant in the communication network. What does active participation mean to the average television viewer? Some of the early uses projected for the network system are:

1. The television set and keyboard response unit serve as a nucleus of a versatile teaching machine. Typically, and at his convenience, the student is presented with material related to his school courses or of interest only to himself. This material is frequently interspersed with questions designed to test the student's understanding, and the student responds to multiple choice questions by means of the keyboard unit. Unless the student continues to respond correctly he is not permitted to go on to new material. Alternative sequences of simpler material and variable approaches to the same instructional goals help the computer system to tailor the subject matter to the student's unique constellation of abilities and background. Immediate feedback on test results, cumulative scores matched against certain norms, and multimedia approaches to the explanation of subject matter all serve to motivate the student.

2. The playing of two-person or multiple-person games becomes possible. In a typical bridge game, the viewer logs into the system by identifying himself through activating his keyboard unit. He views his hand on the television screen and electronically responds with a bid or a pass. His partner's bid is revealed on the screen and card laydowns are transmitted as the game unfolds. A closely coupled intellectual "conversation" is sustained either by the computer simulating players at appropriate levels of sophistication or by linking four players through the network switchboards. Chess, poker, and even bingo are amenable to the initial system.

3. Marketing applications for servicing the at-home purchaser become feasible. A parading of purchasable items across the television screen enables the home viewer to buy any item the budget can afford. Emergency provisions of drugs, food, or household items could be ordered. Instant look up of a savings

or checking account becomes not only possible but necessary if central billing is to be maintained by the computer center.

The development of a computing technique known as "time sharing" makes the project both economically and technically feasible. The near-simultaneous use of a large computer by more than 5,000 persons cuts the cost of computer time to less than a cent per minute per user and gives each subscriber access to the central facility as though the entire computer service was at his disposal. Time-sharing techniques combined with a multiplexing system enable the computer to service each customer with a single pulse of broadcasted information. Each customer or television viewer could be looking at a different display tailored to his request or information need. A static display could be held on the television screen until the viewer is ready for additional information or the next item under study. A xerography process, known as the "proxi system," makes it possible for the viewer to read the displayed information in high resolution form and also to make copies of what he sees on the screen. By requesting and interrogating the computer at will, the user can program his television viewing at his own convenience.

In addition to static displays, as mentioned above, taped films of favorite TV shows and movies are also available to him upon request. The following is a typical example of what might happen when a student takes up a period of machine instruction. The student sits down at this home TV console, facing the viewing screen. On the screen he sees items to look at, to read, to study, or to watch in motion. Over the speaker he receives verbal commentary about what is happening on the screen, or what is going to happen next. At frequent intervals the screen presents a question, and the computer waits until the student selects an answer which he indicates by pushing a button. Immediately after he answers a question (or several questions), the system presents him with feedback, either visually or orally, about his performance. If it is incorrect, the information is explained again using different approaches and the student is given another chance to indicate his understanding of the information by answering another question (or questions). Occasionally a question may require that the student solve a problem before selecting his answer. The student may use his work space to solve the problem with paper and pencil, and then indicate his answer selection. Depending on the subject matter, the student may call up reference material to obtain his answer, or he may elect to review additional study items in a remedial sequence of simpler, more redundant material.

The student proceeds through the lesson at his own rate of speed and receives instruction that is tailored to his level of performance. Some students will cover more material than others in a given time period, but each student will master the material he covers because the system simply will not proceed to new topics until the student has demonstrated this mastery.

By providing convenient, individually tailored, and self-directed instruction in the home, the Maryland State Department of Education expects to solve many of the problems plagueing the school systems and those responsible for adult education.

THE EMERGING TECHNOLOGY OF EDUCATION

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The Emerging Technology of Education

Part I

Introduction and Definition

Education in the United States can be viewed as an institution—social, political, economic. It can also be viewed as a process whereby humans learn and are taught. Subject matter content or skills are also sometimes loose referents to the word "education," in the sense of such phrases as scientific education, physical education, or education of teachers. Finally, there is always a definition which represents a description of the effect of personal experience, as in the classic *Education of Henry Adams*, or in such a phrase as "that experience taught me a lesson in (or gave me an education in) human relations."

These separate but somewhat overlapping concepts (and they are by no means exhaustive) suggest that care need be taken when addressing the problem of the relationships of technology to education. It would appear that the Commission should be interested in the bearings that technology has on education as an institution, a process, and its content.

There is also some disagreement within the educational profession as to what is meant by the expression educational technology (or instructional technology). A group of experimental psychologists would like to confine the term to an empirical approach to the process of teaching and learning.[1] That is, they refer to the work in experimental psychology as a developing "science of learning," and applications of this science—for example, applying the principles of operant conditioning to teaching through programed instruction—as the "technology of instruction."

While these psychologists admit that there is, by no means, a one-to-one relationship between their version of the science of learning and the technology of instruction, they view this relationship as the ultimate goal. There are some real weaknesses to this point of view and it will not be the one from which this paper is written.[2] However, since this relationship does exist to some extent, it will be considered within a broader context of educational technology.

Educational or instructional technology is sometimes too narrowly thought of as confined to hardware. Thus, for example, closed-circuit television or language laboratories represent to many educators the sum total of instructional technology—making it very easy to discuss or dismiss. Actually, much more is involved in the concept. If the point of view is taken that the institution of education in the United States is now the subject of and is moving into the general scientific-technological revolution, then hardware, materials, systems of organization, and new roles for teachers and administrators are all a part of educational technology. Within this broad umbrella, there are subtechnologies; for example, psychological testing, the development of new hardware such as the cartridge-loading 8 mm. film viewers, and the creation of whole systems of materials such as those designed for the Physical Science Study Committee by Professor Jerrold Zacharias to teach high school physics.

Further, when education is viewed as an institution, technology of a sophisticated type can (and is, to a small extent beginning to) play a part in the management and operation of the entire enterprise. For example, data processing machinery and techniques are being used for scheduling, pupil accounting, etc.; modular construction of school buildings is being tried; information storage and retrieval processes are being considered as applicable to age-old library problems.

There are, in addition, economic and other aspects to this general concept of educational technology. These will, in this paper, be interwoven as the discussion criss-crosses between education as an institution and as a process. The general emphasis, however, will be on the subtechnologies most closely related to instruction, as it is felt that this is the current interest of the Commission.

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[1] See, for example, A. A. Lumsdaine, "Educational Technology, Programmed Instruction, and Instructional Services," in *Theories of Learning and Instruction*, 63d Yearbook of the National Society for the Study of Education, part I (Chicago, Ill.: The National Society for the Study of Education, 1964); and James D. Finn, "Instructional Technology," *The Bulletin of the National Association of Secondary School Principals*, vol. XLVII, No. 283 (May 1963), pp. 99–103.

[2] Among other problems associated with this point of view is that the "science of learning" must be a particular psychological position; e.g., Skinner or Bruner. More important is the fact that psychology is not the only science of learning. Social and economic factors introduce other variables.

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These include hardware, materials, systems, organization, and psychological applications.

Sources of Present Concern

Since World War II the national concern with education has been increasing, a concern that took a quantum jump with the unveiling of the first sputnik. Since that time, the national effort to improve the educational system has redoubled several times. However, from the point of view of instructional technology, all concerns cannot be said to originate in the space race. The efforts of the Ford Foundation in the development and promotion of educational television, for example, antedated Sputnik I by several years.

The concerns for education represent a sort of catalog of problems and issues relating to instructional technology. These can be briefly listed:

1. The population explosion with all it implies in terms of more students and fewer teachers and the necessity for new educational arrangements.[3]
2. The information explosion, which presents great problems in curriculum construction (what to teach) and requires greater efforts in increasing the efficiency of teaching and learning (more learning in less time).[4]
3. The general rising throughout the world, including the United States, of the depressed sectors of mankind. Education is seen as the main weapon in the war on poverty, for example, and the requirements of such an educational war include new methods and techniques to reach these people—here and overseas.
4. The urge to raise the quality of life for all, which, in turn, requires raising the quality of education even though the institution is pressed on all sides by population, knowledge, and various kinds of special demands. This situation also sets a requirement, although in a different way, for a more efficient educational process.
5. Research and development on all aspects of education have generated more knowledge about the process and the institution as part of the general knowledge explosion. From this situation rises a drive to introduce all kinds of innovations—most of them relating to instructional technology—into the educational system. Practice in education has, until the last few years, lagged about 50 years behind research and theory. Today the process of educational innovation itself is under study in an effort to speed up the rate of change.
6. The need for education and reeducation and for training and retraining of manpower to meet individual personal needs and national needs increases as society becomes more automated and technologically sophisticated. If, as is often said these days, an individual may have to learn several jobs in a lifetime, the same problems of educational efficiency involving possible uses of instructional technology arise—both on a formal and an informal basis.
7. The ill-defined drive toward a new value system, symbolized by the student revolts at Berkeley and elsewhere and by very personal concerns on the part of a segment of the intellectual community, suggests, among other things, dissatisfaction with the abstract, status-oriented, large-scale organization of the college and university characteristic of a technological culture. Since a return to the colonial college is impossible, solutions to these problems, too, must be found in technology, although the student spokesmen would not understand this. The effort to find technological answers, however, is a function of a technological society as noted by such students of technology as Ellul.[5]
8. There is a cluster of economic pressures pushing for more technology in education. Several foundations, particularly the Ford Foundation, have poured money into the system for developments in this area. The drive to diversify on the part of the aerospace and defense industries (possible sources of educational hardware, materials, and services) as part of the general move into the public sector is another, little understood, aspect of this problem.

No claim is made that the catalog above is complete or that the application of technology to the educational system or to instruction will solve all the problems listed. It is true, however, that a component of educational technology will have to be present in any attempt at a broad solution. It would, perhaps, be well to examine some of the dimensions of instructional technology as it has developed in order better to understand its possibilities.

A Short Historical Background

For the problem at hand, it is crucial to understand the history of the development of instructional technology for the last 50 years. However, the interested scholar may chase this development back much further than the overworked Greeks, if he desires. The great Sumerologist Samuel Noah Kramer puts the invention of writing on clay tablets at Sumer at about 5,000 years ago and then notes that "the Sumerian school was the direct outgrowth of the invention and development of the cuneiform system of writing."[6] To some extent, the development of devices and techniques of communication—the development of a technology of instruction—has affected education ever since.

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[3] A recent report from the TEMPO Division of General Electric in Santa Barbara, Calif., projects the total U.S. population under 20 years of age in the year 2000 at 143 million.

[4] A paper on the explosion of knowledge will soon be released by the Instructional Technology and Media Project at the University of Southern California. In the meantime, a good general reference on a portion of the knowledge explosion may be found in Derek J. de Solla Price, *"Little Science, Big Science,"* New York: Columbia University Press, 1963.

[5] Ellul, Jacques, *The Technological Society*, translated by John Wilkinson, New York: Alfred A. Knopf, 1964.

Skipping over thousands of years, the history of 19th century American education is replete with effective technological developments—including the development of textbooks (to which there was some objection), the blackboard, and even improvements in pens and ink.[7] However, from the point of view of the Commission, the crucial period has been roughly from the turn of the century.

The last 60 or 70 years have been marked by social historians as the period of the so-called "communications revolution"—steam driven rotary presses, photography, motion pictures, radio, etc., with accompanying developments in psychology, mass communication techniques, school organization and finance, etc. The following discussion will break down some of these developments to aid in obtaining perspective.

Conventional Audiovisual Devices and Materials

The best date to mark the beginning of the modern trend of using audiovisual devices and materials in education is about 1920. Before that time, the glass slide, the phonograph record, and to a very limited extent, the 35 mm. motion picture had been in some use. After 1920 developments speeded up, partly due to the use of films during World War I. By 1926, 16 mm. safety film and equipment for education were available, and a start had been made by the Eastman Kodak Co. in producing educational films; radio had reached its commercial stage and a beginning had been made with educational radio; other devices and materials were either developed or improved. Another big change—perhaps the big change—came in the middle thirties with the development of the 16 mm. sound motion picture, the workhorse of the audiovisual movement.

Accompanying these hardware and material developments had been parallel developments in the study of learning from audiovisual materials, beginning with the first studies made right after World War I by K. S. Lashley and John B. Watson, the great experimental psychologists of their day. This connection between some very able research psychologists, students of mass media, etc., and the audiovisual field has continued to the present and has resulted in a respectable literature, much of which is unknown to general educationists, other psychologists, and to many vocal subject matter experts outside the field of education. It is also safe to say that while these developments did occur—partly through the generosity of the Carnegie and Rockefeller Foundations—the application to American educational practice was very limited. There were, for example, only slightly over 600 sound motion picture projectors in the schools of this country in 1936.[8]

By the time the United States entered World War II, an instructor could have had an adequate instrumentation at his disposal. It included still and motion projectors of several varieties, recording devices and players, various forms of printing, chart production, etc., and sound and communication equipment. In addition, a fair amount of material to use with this equipment (educational film, for example) was available, and quite a lot of know-how derived from research and practice was at hand. In fact, however, very few American school teachers had even seen much of this technology, let alone having it available. (In some of the larger cities, of course, it was available, but not too extensively.)

The wide—almost saturated—use of audiovisual materials in the military and industrial training programs during World War II has been well told in several places.[9] This was the first successful mass application of the technology of instruction to the training of large groups of men and women.

Following the war, a renewed interest arose in the American public schools in the use of audiovisual materials. Some States, such as California, made a great effort and supplied funds in quantity for this development. Across the United States, however, the reaction was spotty, and the additional know-how derived from the war effort had little effect in many places.

In the meantime, hardware developments added to the impetus and the confusion. The development of wire and then magnetic tape recording, the long-playing record, improvements in the optics of projection equipment, and the adoption of the overhead transparency projector which had been developed during the war all contributed. Producers rushed in to turn out motion pictures, recordings, filmstrips, slide sets. Research—some of it financed by the armed services—in the problems of learning from these materials was carried on. However, as we approached the middle of the decade of 1950–59, educational interest in what has come to be called conventional audiovisual materials tailed off somewhat. Present developments date from that time and will be discussed below.

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[6] Kramer, Samuel Noah, *History Begins at Sumer*, Garden City, N.Y.: Doubleday and Co., 1959.

[7] Anderson, Charnel. "Technology in American Education, 1650–1900." New Media for Instruction Series, No. 1, Washington, D.C.: U.S. Office of Education, 1962.

[8] Finn, James D., Donald G. Perrin, and Lee E. Campion, "Studies in the Growth of Instructional Technology, I: Audiovisual Instrumentation for Instruction in the Public Schools, 1930–60—A Basis for Take-Off," Occasional Paper No. 6, Technological Development Project of the National Education Association, Washington, D.C.: Department of Audiovisual Instruction, National Education Association, 1962.

[9] Miles, John R. and Charles R. Spain, *Audiovisual Aids in the Armed Services*, Washington, D.C.: American Council on Education, 1947.

Psychological, Sociological, and Educational Developments

Even a brief account of the history subsumed under the title above could fill one or more volumes. The intention here will be merely to outline some of these related developments. The work of Thorndike at Teachers College, Columbia, early in this century set the stage for the development of a scientific psychology of education. Thorndike even anticipated teaching machines and programed learning.[10] S. L. Pressey of Ohio State University, as is well known, discovered certain principles of machine instruction while attempting to produce a test scoring machine in the twenties.

In the early days of modern educational psychology, there was a tight connection between laboratory experimental psychology and educational practice. Gradually this connection eroded. The experimental psychologists shut themselves in their laboratories. Some educational psychologists turned their attention to psychological, achievement, and other forms of testing and developed a formidable subtechnology that has been the object of some recent criticism.[11] Others turned to the field of guidance. The effect on practice, however, was highly variable. By 1955, this trend toward separation of experimental psychology and practice reversed somewhat and added a forceful element to the developing educational technology. This, too, will be discussed below under the present state of the art.

In the meantime, other research workers, principally in the field of social psychology (and, to some extent, related fields), had turned their attention to the mass media of communication. The work of Paul Lazarsfeld both before and after World War II is an example. This, together with the work of communication and perception theorists and industrial psychologists interested in group dynamics, had certain fallout value for educational practice. An educational technology began to develop in the group field which had quite a vogue until the middle fifties. The work of the mass communication specialists and perception psychologists has had some effect on the theory back of the educational use of audiovisual materials.

With respect to the process of education itself—learning and teaching taking place in an institutional setting—theorists in the twenties had great hope of developing something called "educational engineering." The great leader of this movement was W. W. Charters of Ohio State University.[12] Charters' ideas were attacked and pretty well demolished during the thirties by both the social reform and the child-centered philosophers of education. From the middle fifties onward, the Charters' concepts were revived, although in a new form and were seldom attributed to him.[13] Interestingly enough, Charters also had a great interest in audiovisual communication and founded the Institute for Education by Radio and Television at Ohio State in the thirties.

Industrial and Governmental Developments

Industrial developments relating to a technology of education can be briefly discussed with reference to (1) the design, development, and marketing of hardware and environments, (2) the production and distribution of materials of instruction, and (3) intraindustry use of instructional technology.

Generally speaking, hardware, at least until very recently, has not been designed for use in schools. A manufacturer would produce, for example, a motion picture projector designed for the industrial, home, or military market. Small changes might be made for the school market, but the design and reliability needs of educators went unheeded. There was many a tragic joke about the 110-pound school teacher who had to carry a 45-pound projector up three flights of stairs. The whole question of the design of instructional equipment is discussed in a paper of the Technological Development Project of the NEA.[14] Badly designed equipment and equipment mismatched to educational needs were among the causes for the failure of schools to rush to adopt innovations during the postwar period.

School buildings provide spaces for learning—learning environments. As such, they are part of the technology that should aid in learning and obviously should be matched with other technologies that have the same end. Since before World War II, this had not been true. Recently, some signs of change are evident.

School architects have done a pretty good job in providing space for certain special educational functions—gymnasiums, auditoriums, shops, etc.

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[10] Finn, James D., and Donald G. Perrin, "Teaching Machines and Programed Learning, 1962: A Survey of the Industry," Occasional Paper No. 3, Technological Development Project of the National Education Association, Washington, D.C.: National Education Association, 1962.

[11] See, for example, Banesh Hoffmann, *The Tyranny of Testing*, Riverside, N.J.: Crowell-Collier Press, 1962.

[12] One of the writers has on loan from Ohio State University a manuscript for a book being written by Charters when he died. The title is "Educational Engineering"; the date approximately 1952.

[13] An exception is Silvern who has related Charters' ideas to the present situation and credited him for his contributions. See, for example, Leonard Silvern, *Systems Engineering in the Educational Environment*, Hawthorne, Calif.: Northrop Corp., 1963.

[14] Leverenz, Humboldt W. and Malcolm G. Townsley, "The Design of Instructional Equipment: Two Views," Occasional Paper No. 8. Technological Development Project of the National Education Association, Washington, D.C.: National Education Association, 1962.

They have, over the last 30 years, immensely improved the aesthetic quality of the school environment—color, light, etc. They have made the environment more healthful with such things as better lighting and ventilation. They have done almost nothing to help the general instructional process by providing for modern instructional technology. Until recently, the concentration on using natural lighting through acres of glass windows has prevented full use of projection equipment, and many schools today still do not have adequate light control, acoustic treatment, or wiring. Beginning about 1955, this situation, too, has changed for the better.

Problems of the design of instructional equipment over the last 50 years and, to a certain extent, problems of the design of buildings are inextricably related to the economics of education. The manufacturer could not invest the necessary capital to create special educational equipment because his chances of recovery in a reasonable time were almost nil. The manufacturer, therefore, adapted existing commercial equipment and made very few changes in the fundamental models marketed for educational use once they were set. One manufacturer used the same stampings for the body of a projector for about 20 years, ignoring both the needs of the teacher and the technological developments that had occurred during that time.

The economic problems involved in providing an educational technology during this period (1920–55) were complex. The educational establishment had no precedent and no great inclination for investing in a machine technology at all. The local and State system of finance left little money in educational coffers for investment in technological capital. The local nature of the educational market (Robert Hayes, with insight, once called the educational market "clumped," as opposed to homogenous or monolithic) together with local bidding procedures prevented large scale selling. The distribution organizations of the manufacturers were primitive, ranging from one-man camera and music stores to a few large audiovisual dealers with service departments.

The materials side of the developing educational technology over the same period also suffered from a lack of market on the part of the schools and a lack of capital, vigor, and imagination on the part of the producers. The first three large scale efforts to produce educational films were subsidized for many years by industry—partly in the hope of eventually developing a profitable market and partly for what have to be philanthropic reasons. Eastman Kodak subsidized Eastman Teaching Films in the twenties; Western Electric subsidized ERPI Classroom Flims (now Encyclopaedia Britannica Films) beginning in the thirties and running for about 20 years; David Smart began producing Coronet Films on his own estate, using the profits of *Esquire.*

The textbook market, while no doubt profitable over the same period of time, never realized its potential. School systems sometimes kept the same textbooks in use for periods as long as 25 years—with all that implies in terms of outdated learning. It is only very recently that the development of libraries for elementary schools has taken hold, and many junior high school and high school libraries still are pretty bad.

In 1948, the textbook industry had a study made by a consulting firm to see if the industry should expand generally into the audiovisual field. The conclusion was that it should not.[15] McGraw-Hill, a firm that had already made a beginning in this direction, ignored the recommendations and now occupies a commanding position as an overall producer of all kinds of teaching materials. In general, the publishing industry is still not facing up to the general technological developments that are occurring.[16]

As more of the newer media—long playing records, tapes, etc.—came in, the same marketing procedures applied. The supply a school had of new and older materials could only be said to be fortuitous; it often depended upon who called on the superintendent. Maps had to be obtained by mail order or from a salesman who worked a large territory out of his house; the supply of textbooks depended upon the vagaries of State law—in Kansas students had to buy them, but in California they were supplied free (and this had certain political implications in selling); the demand for films, slides, filmstrips, etc., was conditioned upon equipment available and the extent of library service; this was a classic chicken-egg situation and is, incidentally, one faced with the introduction of any new media or technology of instruction (teaching machines—programs, language laboratories—practice tapes).

Beginning with the National Defense Education Act in 1958, the general marketing picture changed radically and with it improvements in the overall technological capital of the educational system. Figures available to 1960, however, indicate that the technological capital of the American education system is still in a primitive state; Finn has suggested that the Rostow concept of five stages of technological growth of a primitive society can be applied to the educational system and that the American educational system may be about ready for technological "takeoff." [17]

Some time and space have been spent on this very sketchy account of the development of some aspects of educational technology in American education in this century because many educated laymen (and for that matter, educators and subject matter experts now attending to the educational problem) are not aware of these developments. Many seem to assume that the concept of educational technology sprang full blown from the forehead of B. F. Skinner about 1954, or began when the Ford Foundation blessed instructional television with money the same year. To some degree, judgments as to what will and should happen with educational technology have to be conditioned on its history—even if every decision made up to this point in time has to be reversed.

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[15] *A Report to Educators on Teaching Films Survey,* conducted by Harcourt and Brace and other publishers, 1948.

[16] Redding, M. Frank, with additional material by Roger H. Smith, "Revolution in the Textbook Publishing Industry," Occasional Paper No. 9, Technological Development Project of the National Education Association, Washington, D.C.: National Education Association, 1963.

[17] Finn, Perrin, and Campion, *op. cit.*

These developments, set arbitrarily from 1955, have led us to the present time. All the evidence suggests that the middle of the fifties marked a shift, a quantum jump, in technological development for American education. This shift brings us to the present state of the art, and it will be described in the following section.

Present State of the Art and a View of the Future

As was indicated above, the year 1955 has been arbitrarily set as the beginning of modern developments in instructional technology that have given rise to such expressions as "the technological revolution in education." This period was examined in some detail in 1960 by Finn.[18] A brief overview of developments in the 10-year period after 1955 should provide a reasonable description of the state of the art.

Hardware

More or less all technological developments during this time—machines, materials, techniques, organization patterns, etc.—may be conveniently classified into two large categories: (1) A technology of mass or large group instruction, and (2) a technology of individual instruction. Developments in instructional hardware fall neatly into these categories.

Television is the instrument par excellence of mass instruction, even if the receiver is watching alone. The promoters of educational television in the beginning viewed television as an instrument designed to help solve the teacher shortage by providing quality instruction with fewer teachers. Television may be either broadcast, closed-circuit, or broadcast on the 2500 mg. band (very short-range broadcasting).

There are now about 100 educational television stations in the United States. The tendency in recent years is for these stations to transmit more cultural programs and more programs of a general educational nature for both adults and preschool children. School broadcasting (instructional television) still occupies some time on these channels. For reception, there were about 50,000 television receivers in the schools in 1962.[19]

Closed-circuit television and the adoption of the 2500 mg. band provide a more direct means for using television in school instruction. The adoption of closed-circuit television has not been spectacular. As of 1963, there were approximately 600 such installations of all kinds in schools and colleges in the United States.[20]

Related to television development has been the development of the video tape recorder. In the beginning, the price was prohibitive for educational channels, but the Ford Foundation eventually supplied the Nation's educational television stations with professional video tape recorders. In the last 5 years, efforts, including competition from the Japanese, have tended to reduce the size, complexity, and price of this equipment. There are still problems of broadcast compatibility (the smaller, less expensive units produce tapes that cannot be broadcast over standard broadcast equipment without some difficulty; they can, however, be used on closed-circuit systems). Video tape recording, of course, permits the freezing, storage, and free scheduling of television instruction.

The other large development has been the language laboratory, a sophisticated combination of sound equipment centering on the tape recorder, now often called the learning laboratory. The language laboratory is a device making it possible to drill many students in speaking and listening at the same time but as individuals. Further, since there are oral (and aural) aspects to other subject and skill areas (spoken literature and stenographic dictation, for example), the possibilities of expanding the use of such a facility are being explored in many places. There are about 10,000 units in the United States, making this development the most spectacular from the point of view of adoption and expenditure of funds.[21] These laboratories range all the way from small portable units that can be set on a table or wheeled around on a cart to very large and complex installations.[22]

A third technological approach to large group instruction is called multimedia, or multimedia-multiscreen. Here the hardware innovations are in the form of control equipment which can operate several different types of projectors, projecting on two or more screens, singly or together. Projection may be from the rear, as in the case of the Multi-Media Laboratory of the University of Wisconsin, or from the front, as in the case of a system developed at the University of Southern California. This technique permits the projection of slides, motion pictures, and overhead transparencies as well as the playing of tapes and recordings, very often with teachers or lecturers playing an integral part in the presentation.

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[18] Finn, James D., "Technology and Instructional Process," *AVER*, winter 1960.

[19] Finn, Perrin, and Campion, *op. cit.*

[20] Campion, Lee E. and Clarice Y. Kelley, "Studies in the Growth of Instructional Technology, II: A Directory of Closed-Circuit Television Installations in American Education With a Pattern of Growth," Occasional Paper No. 10, Technological Development Project of the National Education Association, Washington, D.C.: Department of Audiovisual Instruction, National Education Association, 1963. This figure is now somewhat low due to expenditures in the last 3 years provided under the National Defense Education Act.

[21] Finn, Perrin, and Campion, *op. cit.*

[22] About 2 years ago the American Association of School Administrators launched an attack on the language laboratory, using some research done at the Institute of Administrative Research of Teachers College. The Association is opposed to categorical Federal aid to education, from which funds (NDEA) were, for the most part, used to provide these laboratories to the schools. The NDEA was up for renewal at the time.

There have been small improvements in other forms of mass instructional technology as the conventional audiovisual devices have undergone some development, as, for example, the semiautomatic threading 16 mm. motion picture projector and the semiautomatic or automatic slide projector. In some ways, principally due to improvements in the equipment which made it much easier to use and to a superb approach to marketing by one large company, the Minnesota Mining and Manufacturing Co., the overhead transparency projector has now become a great contender for the educational technological innovation of the decade, after languishing since its development from the bowling alley projector by the Navy in 1941. Coupled with the tremendous increase in the equipment has been a tremendous increase in eggs or chickens, as the case may be. Transparency materials of all kinds, some prepared transparencies, some materials making it easy for teachers to prepare, and some sort of in-between arrangements, like cake mix, have become available. By far the most widely used process recently has been the heat transfer, office copy machine since transparent materials have been developed to use with it.

Principally due to publicity, the technology of individual instruction is thought by many to center on the teaching machine. This is not the case. When B. F. Skinner published his famous article in *Science* in 1958,[23] a great interest developed in teaching machines and programed learning. This interest not only engaged psychologists, but also segments of industry from small inventors to large firms. From late 1959 to 1962, a rash of companies went into the teaching machine business (see Finn and Perrin).[24] Most of the small ones have disappeared, and most of the large ones have dropped the projects.

This situation had several causes. The educational community was hardly ready for such a startling innovation; the whole business suffered from the same old chicken-egg situation. There were not enough programs for the machines; the machines were not standardized so that one program could fit another; most machines were poorly designed; most programs violated all principles of programing. Research showed no difference between machine and book-type programs. Programed instruction survived in the form of books, notebooks, and other ways of using printed material without machines and is, at present, the captive of publishers who are not particularly interested in a machine approach.

The teaching machine, however, is not dead. Some experimentation continues across the country. In a few places, third and fourth generation machines have been produced. The basic problem in the early days was that teaching machines attempted to present verbal information only. This was all that most programers knew how to prepare. The capability of a machine, however, is in the direction, on the one hand, of a complex stimulus—picture, sound, color, as well as words—and, on the other, of a complex response mechanism relating the student's response instantaneously to the task at hand. This leads to audiovisual stimulus machines and computer control—items that will be discussed in the next section.

In addition to teaching machines per se, a range of devices is in use or development that constitute a solid technology of individual instruction. Using phonograph records and, later, magnetic tape, some teachers began experimenting with "listening corners" in the elementary school shortly after World War II. Headphones on gang jacks were developed so that several children could listen at once without disturbing the class. Later, illustrative materials in the form of filmstrips and slides and various kinds of workbooks and directions were added. A sort of home grown individual instructional technology was developed in a few places.

Following on the heels of this, several manufacturers brought out well-designed listening and viewing devices for filmstrips, tapes, sound filmstrips, etc. (Various types of reading pacers fall into this category.) The materials producers have not kept up with this development too well, although they have produced some materials. A lot of work remains to be done to produce the proper kind of material for individual as opposed to group use.

However, the most significant development on the individual instructional technology front has been the growth of 8 mm. film. About 1960, sound was added successfully to 8 mm. film; this event triggered a large number of developments in 8 mm., many of them, interestingly enough, in the silent field. Although 8 mm. may be projected for fairly large groups and, with the new format just announced, will probably generate a projected image about as good as 16 mm. was 10 to 15 years ago, it is in the field of individual instruction that 8 mm. seems to be destined to make its mark.

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[23] Skinner, B. F., "Teaching Machines," *Science*, vol. 128 (Oct. 24, 1958), pp. 969–977.

[24] Finn and Perrin, *op. cit.*

The small, inexpensive technicolor cartridge-loading projector for individual viewing is already finding much use and has started a new materials movement known as "the single concept film." The single concept film is a 2- or 3-minute film on a self-winding cartridge that may be inserted in the projector and be ready to project. It covers a single idea, for example, nuclear fission. The Air Force recently ordered a quantity of these projectors with stop-frame devices which make it possible to program the films and use the projector somewhat as a teaching machine. Viewing devices for 8 mm. sound film are also coming on the market. What this will do to television is still not clear, especially since there are other developments in the video tape recording field that bear on the problem of individual viewing and listening.

Materials—Systems

In the last 5 years, a great deal has been heard about the "systems approach" in education. This interest has increased recently; there are projects at Syracuse University, Michigan State University, and the University of Southern California that are working on certain aspects of the problem. The systems concept in education is related both to materials and to hardware as well as to certain psychological and philosophical concepts.

Technically, if you consider such expressions as the educational system, the school system, and the State system of higher education, then an instructional system is a subsystem. It is this subsystem that is generally the object of the systems approach in education.

One way to understand the developing instructional system is to approach it through the materials of instruction. In this sense, the idea is not too new; for example, with the introduction of graded readers accompanied by workbooks, etc., in the twenties, a sort of system of teaching reading was introduced into the schools. However, the decade we are examining has seen a speeding up of trends toward systematic organization of the materials of instruction. This trend was identified by the Technological Development Project of the NEA as "from kits to systems."

There are now available all sorts of kits for teachers to use which consist of a variety of materials organized around a topic, such as a country (Japan), a process (wheat—bread), or a concept (energy). These kits often include paperback books, filmstrips, realia, phonograph records or tapes, etc. The kit is accompanied by a manual which suggests how the resources may be deployed.

Another systematic approach to instruction began several years ago with the production of a whole series of film lessons (162 half-hour films) in the field of physics. This was followed by other film series in other areas. These were not simply "aids." They were systematic presentations of content accompanied by suggestions for other activities and related, to some degree, to texts or other materials.

The concept of the Physical Science Study Committee project under the direction of Professor Zacharias developed an even more systematic approach. Here, beginning with a thorough textbook revision, laboratory exercises, an apparatus, a whole film series, and some other materials were prepared. This development was accompanied by tryouts in the schools and a program in the summer for training physics teachers to use the materials. While not developed exactly according to accepted principles of systems design, it could be said that the Zacharias group developed a system for teaching physics.

The foreign language field has recently contributed some very systematic approaches to instruction. There is one system for teaching elementary French which consists of books, workbooks, tapes, records, and films. These materials can be supplied in a case with the necessary hardware. The films supplied, while in color, come in both 8 and 16 mm., and can be used on television.

Throughout the materials field, organized and semisystematic collections of instructional materials continue to make their appearance. Eight millimeter single concept films are being marketed in sets and are related to textual materials; even the textbook industry is publishing sets of books, workbooks, tests, and materials from which overhead transparencies can be copied. Some of the newer work, as, for example, by the AIBS (biology) group is even more systematic. Materials now being tested by this group lead the teacher almost step by step through the teaching process.[25]

It is, I believe, safe to say that this move toward organization and system in the instructional materials field is one of the most solid trends of the technological revolution in education. Its implication for the role of the teacher of the future, is, of course, tremendous.

The systems approach to instruction also has a hardware aspect. Up to the present time this has shown up principally in an attempt to bridge the gap between the technology of mass instruction and the technology of individual instruction. In a sense the language laboratory has always done this, as the individual student in the laboratory deals with what is, in effect, a mass communication system.

However, there are several devices now being used that bridge this gap more directly. These devices provide for mass stimulus (television, projection, or multimedia presentation) but allow each individual student to react to what he sees by pressing a button, turning a dial, or otherwise informing the system as to his response. These devices go under the general name of classroom communicators. One such device is now being used in several of the Job Corps camps. The data derived from the students' response can be processed in several ways; for example, providing the teacher with an immediate readout of how well the students are performing. The materials for such a system have to be very carefully programed and are, of course, highly systematic. This requirement is the biggest problem in connection with the use of this equipment.[26]

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[25] See, for example, Biological Sciences Curriculum Study, *High School Biology, Special Materials: Teacher's Manual (Revised Edition)*, Boulder, Colo.: Biological Sciences Curriculum Study at the University of Colorado, 1964.

There are several other ways to consider the systems approach to instruction. For example, the small group interested in computer applications to education seems to take the position that the only systems approach to education is through the computer. This will probably be the ultimate systems approach.[27]

Organizational Concepts

As was indicated by the introductory material, organization is a major aspect of technology. As might be expected, organization concepts better fitted to present educational needs are being suggested and applied. We are considering here only organization for instruction—not other proposals having to do with the governing and financing of the educational system as a whole.

In essence, there are two such organizational patterns on the current scene which have many common aspects. The first, usually associated with the name of John Goodlad, reorganizes the elementary (and junior high) school into an ungraded pattern, permitting the individual student to progress much more easily at his own rate. The system of grade classes, imported from Germany in the 19th century, is unrealistic in the sense of human variability. It was, in its day, a technological solution to a chaotic problem. Whether the ungraded elementary school is the answer for 1965 yet remains to be seen. The requirements in terms of materials, individualized instruction, and the like are frightening.

The second new system of organization is applied to the secondary school and is usually referred to as the Trump Plan after its originator, Lloyd Trump. Trump has attempted to break up the "egg crate," 30-student-to-a-classroom situation in the high school and provide for large group instruction (40 percent), small seminar instruction (20 percent), and individualized instruction (40 percent). This concept is formally referred to as the Staff Utilization Plan. Inherent in this system is the idea of team teaching where teams of teachers, sometimes under a master teacher, manage these several responsibilities. Various aspects of this plan have been tried out all over the United States, and the idea seems to be moving into practice. It should be emphasized that the Trump Plan is also postulated on a much wider use of instructional instrumentation than now exists, particularly for large group and individualized instruction. (Many existing team teaching experiments do not have this component.)

Curriculum Reform

Another aspect of the technological revolution in education is curriculum reform. Reference was made above to the Physical Science Study Committee. The PSSC set the pattern for curriculum reform, backed by money from private foundations and the National Science Foundation. Since that time, following the PSSC pattern to some extent, groups in biology, chemistry, mathematics, and many other fields have been organized. As of 2 years ago, the NEA identified 37 such projects. Almost all of these have an orientation to instructional technology in some or all of its aspects—television, programed instruction, films. In other words, the approach to the radical revision of the educational process is through the materials and devices of instruction.

The Current Situation in Educational Psychology

If the approach to change in education is viewed, at least in some quarters, through the materials and devices of instruction, it follows that the psychological orientation of these devices and materials within the teaching-learning process is of crucial importance. This is the area of applied educational psychology, or, as was indicated in a previous section, what some theorists, such as Lumsdaine and Glaser, consider to be the technology of instruction.

The current situation, however, within educational psychology is, to say the least, mixed. Very few theorists or practitioners would be willing to say that one given point of view has achieved all of the answers. In the general practice of schoolkeeping today, an eclectic point of view as to theory coupled with a large portion of experience-passed-on-down constitutes the operational base.

Within the general literature of learning theory and related matters, there have been many attempts to distinguish, describe, even to reconcile various theories of learning. Hilgard, for example, in a classic work treats nine theories of learning.[28] Such considerations are important to the scientist exploring this area, but it is highly likely that most practitioners today—teachers, materials producers, etc.—could not make the sometimes subtle distinctions between these points of view, and certainly could not consciously apply these distinctions to real life problems of teaching and learning.

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[26] The best such program the writer has seen is one developed for the retraining of bus drivers by Western Greyhound using films and slides on a system known as the EDEX.

[27] See the paper prepared for the Commission by Donald Bushnell for a complete discussion of this aspect of educational technology.

[28] Hilgard, E. R., *Theories of Learning* (2d ed.), New York: Appleton-Century-Crofts, 1956.

The unintiated person reading only a portion of the literature might get the impression that the matters of teaching and learning were pretty well settled by the psychologists. This is not the case. However, since the educational process is ongoing and since children and adults come to school daily, some kind of commitment to a point of view is often made, particularly at the growing edge of educational technology. The following brief description of the situation must be read with this fact in mind and also remembering that most practice does not have a coherent theoretical base.

The most dominant point of view within the area of instructional technology today is that of Prof. Jerome Bruner of Harvard. Professor Bruner's point of view has been adopted by the Zacharias group which began the national movement of curriculum revision through the materials and devices of instruction with the physics course of the Physical Science Study Committee. This group has extended its activities to such areas as elementary school science,[29] and its point of view and methodology are, it is believed, dominant throughout almost all national efforts at curriculum revision, even including music and the fine arts.

At the great risk of oversimplification, Bruner and his colleagues, because they have carefully and brilliantly studied what is known as cognitive structure (an individual's organization, stability, and clarity of knowledge in a particular subject matter field at a given time), have emphasized two general concepts: (1) Knowledge in a given field has a structure that can be taught and on which all individual facts and events can be hung; and (2) such a structure is best learned by the method of "discovery" or "inquiry," which in turn will help the learner be more creative and able to learn all his life. Bruner's ideas have received great acceptance among scientists, mathematicians, and, interestingly enough, from many old-line progressive educators. A popular source for Bruner's ideas is his little book *The Process of Education.*[30] His concern with other aspects of learning may be found in another small volume, *On Knowing.*[31]

Again, recognizing the difficulties of oversimplification in a brief treatment such as this, B. F. Skinner, also of Harvard, can be thought of as holding a point of view almost directly opposite to that of Bruner. Skinner has recently criticized the Bruner position in a popular article[32] and in a technical essay.[33] Skinner, recognized as the father of teaching machines and programed instruction in the modern sense, has a theory of teaching and learning known as operant conditioning in which the individual learner's behavior is "shaped" by positive reinforcements administered under certain contingencies and following certain schedules. Theoretically, programed instruction of the so-called linear type is designed to do this. In practice, very few programers write programs according to pure Skinnerian principles. Skinner has had an enormous influence on the thinking of psychologists, and it is safe to say that most psychologists today are behaviorists who would be willing to accept a great deal, if not all, of Skinner's point of view. The fact remains, however, that his influence on educational practice, particularly on educational technology as it is being applied, is small compared with that of Bruner.

A third point of view, for the moment somewhat outmoded, may be described as antitechnological and existential. It is stubbornly held, however, by a portion of the educational community, notably those most concerned with child development and the person, and some of those concerned with creativity. These latter often accept much of the Bruner position in addition. In some ways this position combines a little of the old Gestalt concepts with the so-called assumptive view of perception and a great deal of emphasis upon self, self-actualization and self-perception. These concepts, combined with certain others derived from psychotherapy are often referred to today as "existential" psychology.

As was mentioned, there are, of course, other theories of teaching and learning; the so-called neobehaviorists, for example, adhere to a range of closely overlapping points of view. We are speaking here primarily of the views of practitioners (considered broadly) concerned with developing educational technology. In this connection, several newer positions which appear to have promise for or are related to instructional technology should be mentioned. Studies in neurophysiology have resulted in a theory of thought in behavior dealing with the electrochemical functions of the central nervous system; memory has been studied with reference to changes in nervous structure, etc. Such a viewpoint is appealing to some theorists in instructional technology, probably because of its science-technology relationship. One of the leaders in this field is D. O. Hebb.[34]

Closely related to the interest in neuropsychology and even more closely related to developments in technology in general is what is often referred to as the cybernetic model of behavior and learning. Essentially, this viewpoint undertakes to explain thought and behavior in terms of models derived from the studies of computers. An excellent statement of this position may be found in Miller, Galanter, and Pribham.[35] In many ways, this theory can be considered an information theory of learning and is related to an even more elaborate concept, J. P. Guilford's structure of intellect.[36] David Ausubel has recently published a theory relating only to what he calls "reception learning," or the processes of learning meaningful verbal materials, arguing that this type of teaching is what is principally done in school.[37] All of this work suggests that it will influence technological applications in education within the next decade. If this is true, some changes in current trends will occur.

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[29] See, for example, *A Review of Current Programs,* Educational Services, Inc., Watertown, Mass., 1965.

[30] Bruner, Jerome, *The Process of Education,* Cambridge, Mass.: Harvard University Press, 1960.

[31] Bruner, Jerome, *On Knowing,* Cambridge, Mass.: Harvard University Press, 1962.

[32] Skinner, B. F., "Why Teachers Fail," *Saturday Review,* Oct. 16, 1965, p. 80.

[33] Skinner, B. F., "Reflections on a Decade of Teaching Machines," in *Teaching Machines and Programed Learning, II: Data and Directions,* Washington, D.C.: Department of Audiovisual Instruction, National Education Association, 1965, pp. 5–20.

[34] Hebb, D. O., *The Organization of Behavior,* New York: John Wiley and Sons, 1949.

Finally, it should be noted that both dominant and emerging theoretical positions in the literature (which have been applied in small areas of technological practice in some instances) merely emphasize the fact that the educational practitioner cannot turn to a science of learning for his answers. This has resulted in a technological or empirical approach to solving practical problems of teaching and learning. This point of view in espoused by Ofiesh and is contained in part II. The empiricists hold that materials, devices, and processes must be validated in advance in terms of well stated objectives of instrutcion on the students on which they are to be used. In other words, materials, processes, and devices are produced on a best-guess basis, are tried out, are refined or changed as necessary, and are tested again. The process is repeated until a system that works is derived. Such a concept can be considered as a sheer technological or engineering approach and is so referred to by those who advocate it.

If present efforts at research, development, and theory construction continue to expand; if, for example, the national research and development centers and the regional educational laboratories take root and grow, it can be expected that a much greater alignment of theory and practice of teaching and learning will come about within the next two decades. While it is unlikely that the answer will be achieved in this first new thrust, the move toward the classic relation of science to technology in the field of education will be speeded up.

Research and Development

The history of research and development in the field of instructional technology is a long story in itself.[38] Contributing to the quantum jump of 1958 in this field was the passage of title VII of the National Defense Education Act. Title VII provided both for research in the new media field and for dissemination of information about new media to the educational community. Although the amounts of money available have been small (too small), the effect has been large. Psychologists and other educational research workers have turned their attention to educational media, and fundamental questions concerning effectiveness and use of the technology of instruction have been investigated.

The Cooperative Research Group in the U.S. Office of Education has also funded some studies in the field of instructional technology, and some research has been backed by other Government agencies concerned with manpower retraining, etc. Compared to the need, this research effort is still too small and the dissemination of the results of this research leaves much to be desired.

The new Elementary and Secondary Education Act of 1965 contains a provision for $45 million for what are known as regional educational laboratories. These laboratories (actually, they will probably be more like groups of cooperating institutions and school districts) are supposed to do research and then apply the results of this research to practice. The task force, which worked preparing the background for the bill, had in mind something like Professor Zacharias' Educational Services Inc., a nonprofit corporation which produces the materials for PSSC and other curriculum projects. However, it is likely that the organization of the laboratories will be much broader. There is no doubt, however, that there will be a large component of activity relating to instructional technology in these laboratories.

While many important research questions need to be settled, the great problem is the dissemination of the results of this work and the application of these findings to practice. To take just one example, there is very little evidence that the research findings on programed instruction have actually been applied in the construction of many programs that are available; further, the use of programed instruction in the schools remains at a minimum level—the movement has not affected practice a great deal.

The great foundations of this country have contributed both to the research effort surrounding instructional technology in this decade and to the development work associated with it. Actually, foundation support has principally been for development and, as such, it has been more of an economic than an intellectual force. Because of this, it will be treated in the next section.

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[35] Miller, G. A., E. Galanter, and Karl Pribham, *Plans and the Structure of Behavior*, New York: Holt, Rinehart and Winston, 1960.

[36] Guilford, J. P., and P. R. Merrifield, "The Structure of Intellect Model: Its Use and Implications," Los Angeles: University of Southern California Psychological Laboratory (Report #24), 1960.

[37] Ausubel, David *The Psychology of Meaningful Verbal Learning*, New York: Grune and Stratton, 1963.

[38] The Instructional Technology and Media Project at the University of Southern California will soon release a paper covering the history of research and development in instructional technology.

The Infusion of Capital

If technological capability—machines, materials, etc.—is viewed as capital, the educational system of this country is still poverty ridden. Using hardware as a measure of this capability, Finn, Perrin, and Campion found it to be relatively low.[39]

This low capital level is why, during this crucial decade of 1955–64, foundation support has in many cases been decisive and has turned the path of American education into new, technological directions. The role of the Ford Foundation in this picture cannot be underestimated. Especially in the field of television, the support from the Ford Foundation was decisive. This included help for weak educational television stations, the establishment of the National Education Television Network Service, support for a national effort in instructional television, the institution of the airborne television program in the midwest (MPATI), etc. Millions of dollars helped build technological capability and, of course, included other activities besides television; for example, the founding and support of the Educational Facilities Laboratories which are designed to improve educational construction of all kinds.

Other foundations, notably Carnegie, also contributed to this buildup. However, other than television, viewing the needs of the country as a whole, all the foundation money put together could only be described as seed corn. It remained for the U.S. Congress to provide funds for a much larger capital infusion into the American educational system.

From the point of view of educational technology, title III of the National Defense Education Act made all the difference. In its original form, it provided money on a matching basis for States to furnish local school systems with funds to purchase materials and equipment for teaching science, mathematics, and modern foreign languages. This provision has since been expanded to cover other areas of the curriculum. Under the older restrictions, approximately 60 to 70 percent of the funds went into science equipment and the balance into audiovisual materials and equipment. These percentages are no doubt changing and, during the last year, the amount of money expended under the provisions of this title was about $90 million.

Almost all of the acts relating to manpower (manpower redevelopment and training, vocational education, etc.) are designed to provide money for research and for teaching equipment and materials. No estimates were available to the writer as to the exact amount of such funds, but they are considerable and will contribute to the overall increase in technological capital for the educational system.

Acts of the Congress relating to manpower were climaxed with the passage of the Economic Opportunity Act of 1964—the so-called War on Poverty. In the act, provision is made for centers for the basic education and vocational training of jobless youths. In the organization and development of these centers, the assumption has been made that a great deal of use must be made of instructional technology because the system of instruction, it is believed, must be considerably different from that used in schools from which these young people dropped out in the first place. Because the main Job Corps training centers are being operated by private industry in many instances, every effort is being made to apply the best that is known in the instructional program of these camps. Money is available. Camp Parks, for example, installed about $90,000 worth of television equipment. This development will have far-reaching effects, but they have yet to be assessed.

The latest act of Congress affecting instructional technology is the Elementary and Secondard Education Act of 1965. Mention has already been made of the laboratory provision. One title of the act provides for the strengthening of library services, and this will add to the technological capital available to schools, as library services will include materials other than books. Another section provides for supplementary educational centers. These are conceived very broadly and will contain everything from guidance and remedial services to resident musicians. These centers will obviously have a media component and may end up as, among other things, regional centers for more sophisticated technological services. Plans for these programs are just being laid.

There are other governmental influences in the field of instructional technology; for example, the wide use of many of these techniques in the training programs of the Armed Services. Further research in the field of instructional technology is being conducted by HumRRO for the Army and by other defense agencies.

The picture adds up to the fact that an increase in the technological capital of the educational system of the United States can be expected in the next few years as a result of Government programs. The extent of the increase, its general acceptability, and its effect remain to be seen. At present, from the point of view of the existing, let alone the future, technology, the American educational system is undercapitalized.

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[39] Finn, Perrin, and Campion, *op. cit.*

The Response of Industry—Diversification and Reorganization

Accepting the fact that the American educational system remains primitive from the point of view of technological development, it is no different from other parts of the public sector, such as the field of social work. This concept, of course, can be traced to Galbraith who suggested in the *Affluent Society* that investment must move into the public sector and that we should treat such institutions as education with at least as much generosity as we do Las Vegas or the Strategic Air Command.

In addition, the economics of the defense and space programs cannot forever remain at the same levels. These programs have created great scientific-based industries with tremendous technical and manpower capabilities. Reduction in space and defense programs could cause social problems of no mean magnitude. It is no accident, therefore, that the Galbraithian concept of beefing up the public sector of the economy should be linked to the potentials of the aerospace, defense, and science-related industries.

With some anticipation in the earlier manpower acts, this policy became reality when the Economic Opportunity Act of 1964 provided for the participation of industry in the Job Corps and other programs. This put the science-related industries into the education business and, in the perspective of the general scientific-technological revolution, was inevitable anyway. Further, many of these industries or industrial groups had made previous passes at private educational developments (teaching machines, computer scheduling services to schools, etc.) and already had created some special educational capability.

The various acts discussed above provide a considerable amount of money and are an enticement for the science-based industries to enter the educational field. Since most of them have a quick-reacting capability, it was to be expected that the last few months have been occupied with tooling up, preparing proposals, reorganizing in the direction of what can only be called "educational diversification," and otherwise preparing to move into this new enterprise.

Several of the large Job Corps camps, as was indicated above, are being operated by these industries, sometimes in combination with a university. However, the most interesting signs are those related to mergers, acquisitions, joint venture agreements, and the like. Raytheon has purchased EDEX, a classroom communicator manufacturer, and Dage Television. Xerox has created a research laboratory in the basic behavioral sciences and has acquired Basic Systems (a programing group) and American Educational Publishers; Westinghouse has acquired the entire programing capability of Teaching Machines Inc.; Litton Industries and Hughes Aircraft have both built up inhouse capabilities in these fields and, particularly in the case of an acquisition-oriented company like Litton, acquisitions of various kinds may be expected. This is a partial and very incomplete list, but it is illustrative.

These industrial groups are aggressive and have access to highly educated manpower both inhouse and on a consulting basis. The effect of these developments is not yet clear, but some of them ought to be pretty obvious. There is not too much manpower available in the instructional technology field, and hence, there will be competition for manpower.[40] The very existence of technology-based instructional programs in Job Corps camps, etc., will put pressures on the schools. School board members may not be so reluctant to vote funds for instructional technology once the industrial factor becomes evident, and they may even put pressure on school administrators.

Since this is just the beginning of this phenomenon—essentially a phase of the scientific-technological revolution—much more can be expected to come out of it.

Trends—A Forecast

The preceding section covers the current situation with emphasis upon the decade 1955–64, a crucial period for the development of educational technology. The changes occurring during this period were so striking (and some of them, such as the language laboratory, so unpredictable) that forecasting in this field appears extremely risky. Further, it cannot be overemphasized that developments involving any appreciable degree of novelty are still very slow to affect educational practice. In effect, events occur at two levels: An analogy might be to consider the interest in research and development now occurring in educational technology as the upper level of ocean currents which can be seen and measured, and actual practice in the majority of educational institutions and systems as the deep, slow swelling, cold currents that move in their own time and are difficult to detect.

Nevertheless, there are probabilities and trends in the situation, and prediction is possible, although its accuracy cannot be stated even with the precision of probability statements now used in weather forecasting. What follows in this section is such a prediction; it is the sole responsibility of the principal author. For reasons which should become clear, this forecast is divided into two parts—a short-range forecast and a long-range forecast.

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[40] One of the writers had one doctoral candidate in the spring of 1965, who received four job offers in 1 week. Two were from universities and two were from industries. He took an industrial job.

The Next 5 to 10 Years

An analysis of the situation suggests that the next 5 to 10 years will be a period of consolidation and spread into educational practice of the technological developments of the last decade. The educational system has, in effect, been threatened with novelty; in the coming decade the novelty will be absorbed to the point where it will be no longer novel. There will be some new developments; these, however, will tend to be in the political-social-economic sphere and not, as many of the current thinkers in educational technology suppose, in materials, hardware, and psychological breakthroughs. Breakthroughs and novel developments are always possible these days, but the current trends continue to suggest that their time is, perhaps, a decade or more away.

Based on the generalization that consolidation of gains will characterize the next decade, the following forecast is made from current trends:

1. *Innovation—Change.* It has become the official policy of the U.S. Office of Education to encourage educational innovation; further, the concept of innovation is "in" with the entire educational community at State, regional, and local levels. Three forecasts can be made in this area:

a. The principal site of education innovation will change from the lower levels of the school system to higher education. Colleges and universities will be forced to innovate, principally due to the flood of students, but with other factors acting as an influence as well. Universities, while sources of innovation for the whole culture, have been loath to make drastic changes in their own procedures, particularly their teaching procedures. The innovations which will be forced on the higher educational system during the next decade will, therefore, cause a great deal of strain.

b. With respect to the system as a whole—particularly the public school system—educational innovation will become institutionalized, centering upon the U.S. Office of Education and secondarily, the several State departments of education. Existing legislation and plans and the influence of a new educational establishment will all combine to push this now visible trend into actuality.

The principal instruments for this institutionalization are likely to be the regional laboratories now being set up by the U.S. Office of Education together with regional educational centers to be set up under title III of the Elementary and Secondary Education Act of 1965. The regional centers do not have to have this function, but at this writing, it looks as though part B of this section of the law, which does provide for exemplary (i.e., demonstration centers designed to spread innovative ideas) projects, will receive precedence over regional educational services. However, even if these instruments are not used for one reason or another, others will be found, and the innovative process will be institutionalized.

c. With the institutionalization of educational innovation, two things will happen. First, the innovations themselves as they are picked up by units of the system (schools, school districts, colleges) will become simplified and vulgarized, sometimes beyond recognition, and will lose a great deal of their power. This is principally due to the fact that the system as a whole is not sophisticated enough to absorb many of the new processes and procedures with all of their subtleties and qualifications. Secondly and more important, as the process of innovation is institutionalized, innovation will gradually become little more than change. This is based on the assumption that the "invention of the method of invention" as applied to educational innovation—and that is the avowed purpose of this institutionalization—will not necessarily work with the same force that it has with industrial technology. It is likely that the true innovators will begin to drop out of such an institutionalized system, and the remaining bureaucracy will not be capable of far-reaching innovation.[41]

2. *The Development of the New Educational Establishment.* American education has always seemed to have more common procedures, goals, and even buildings and teaching materials than are warranted by existence of 50 autonomous and presumably different State school systems. There are many reasons for this, but among those often cited is the existence of an educational establishment. In the past, it has been stated that this establishment has consisted of the national educational professional associations, the teachers colleges and schools of education in universities, and the State departments of education. After 1950, this establishment came under heavy fire, and beginning about 1955, a new educational establishment began to emerge.

The significance of this new educational establishment for this paper is that it has a scientific-technological base. Essentially, it consists of four or five of the leading higher institutions in the United States, several foundations, a component of the new scientist-politicians that have emerged in the last 20 years and some able individuals both within and without Government. Its relation to the older establishment is almost nil.

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[41] This is why the principal author has some doubt as to Oflesh's proposal in part II. The proposal is for another form of institutionalization. For an interesting discussion of the difficulties of change in an educational bureaucracy, see the article by H. Thomas James, "Problems in Administration and Finance When National Goals Become Primary," *Phi Delta Kappan*, December 1965, pp. 184–187.

The next decade will see the complete domination of educational thinking in this country by this new establishment as it develops and consolidates. Nothing in this statement should be construed as suggesting that there is anything conspiratorial about this emergence. It is doubtful, for example, whether individuals now belonging to the new establishment even know it as such. Rather, the emergence of such a group of intellectual leaders for education was almost foreordained by the development of our advanced technological society. Henceforth, the new establishment will orient American education more in the direction of science and technology as associated with its own processes and will absorb only that part of the older establishment which will fit this overall scientific-technological pattern.[42]

3. *The Systemization of the Materials of Instruction.* The already well-developed trend toward more systematic organization of instructional materials will reach fruition in application in schools and colleges within the next few years. Systems of teaching the structure of subject matters and certain skills such as reading will be applied on an increasing scale. These systems will make use of all of the available instructional technology [43] and will absolutely control the curriculum in the areas (such as physics) where they are applied. To some degree, competing systems will be created, and schools and colleges will be asked to choose among systems; however, since these systems are expensive and take years to develop, the choices will be limited. Further, there will be problems of obsolescence and logistics associated with them for which the schools and colleges are ill prepared.

The materials within these systems (films, programed learning sequences, videotapes, books, etc.) will increasingly be tailored directly to learning tasks and will represent much more of a rifle approach than the historic shotgun approach of the standard textbook or educational film. As such, their overall effect should be much more efficient. Further, research now going on in several places should have begun to supply some answers to the general question as to which medium is the most effective for a given purpose. If these answers do develop, the emerging instructional systems will also reflect this knowledge. Increasingly large amounts of money will be spent on developing these systems.

4. *Developments in Hardware.* Hardware, particularly in sophisticated systems, such as military weapons systems, can change or develop rapidly. On the other hand, in the consumer field, such as refrigerators and automobiles, the changes tend to be slower and are often more apparent than real. In the field of instructional technology, both possibilities are present.

a. *Optical-photographic versus electronic systems.* Because of the long leadtime that optical-photographic (conventional audiovisual) systems (projectors, film, etc.) have had on electronic systems (television, videotape, etc.), existing instructional hardware is heavily weighted toward the optical-photographic for pictorial (and audio) storage and transmission. Further, photographic information is still superior to electronic by a factor of, perhaps, 100 to 1. There are other influences as well, such as accessibility.

The next few years will see a continuing invasion of this field by electronic transmission. Improvements will be made in the information capabilities of electronic systems; the transmission of color will become cheaper and easier; accessibility will be improved through cheaper videotape-type storage; and videotape recorders and players will become smaller, less expensive, and easier to operate with reliability. By the end of the decade, a new balance will have been achieved between these two (partially) competing systems. Neither will disappear, but electronic storage and transmission or combinations of electronic and optical-photographic systems will claim a much greater share of existing hardware designed for pictorial storage and transmission than is the case now.

b. *Television, videotape, etc.* As indicated above, videotape players and recorders will become smaller, cheaper, and more reliable. Whether the current methods of recording on magnetic tape will still be in use might be in question, as there are several other ways to use electronic impulses to record information on some medium; thermoplastic recording is an example. The precise means is unimportant from the educational point of view. What this does mean is that images and sound will be available in inexpensive, easy-to-use form.

In addition, it is to be expected that television will expand in its educational aspects during the same period of time. This expansion will principally be in the closed-circuit and 2,500 mg. areas and not in broadcast television for schools and colleges. The expansion will occur first in higher education, and it can be fairly confidently predicted that interinstitutional cooperation in the use of television, such as has been experimented with in Oregon, will be extended as the pressures on higher education increase. A professor in one institution teaching a class in another, or several others, will not be at all unique except in small enrollment, prestige institutions. Even in such cases, lectures from Nobel Prize winners and the like will probably be delivered by television.

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[42] In this connection it is fascinating to note that recent news stories report that the new Russian educational program was prepared by a commission composed of members from the Academy of Sciences and from the Academy of Pedagogical Sciences.

[43] It is believed that forecasts which claim all instructional systems will be computer controlled in the near future are wrong by at least 20 years.

Along with these developments in television and, for a while at least, overshadowing them, will be an enormous increase in the use of telephone lines to transmit certain kinds of educational materials. The last few years have seen some growth in the so-called "tele-lecture" technique where the lecturer at one location can speak to a group via amplified telephone at some other location. Recently, as at the Harvard Business School and in connection with various medical education projects, conference-type seminars between groups have been held using the telephone system. A new invention makes it possible for a teacher to draw while lecturing over the telephone and have the image projected by a special overhead projector at the receiving end; slides and other materials distributed in advance have also been successfully used with tele-lectures. Since this procedure is relatively inexpensive and very useful, it may be expected to grow spectacularly during the decade.

c. *Other hardware developments.* While improvements and changes may be expected in all audiovisual equipment, it is likely that the major advances will occur in the field of self-instructional devices. There are, at present, several prototypes under development of multimedia machines (still and motion picture and sound) designed as individual instruction devices. While the history of this type of teaching machine has not been too spectacular up to this point, it seems reasonable to predict that the next decade will find several types of these in use. This, of course, will set a new requirement for programing and production of materials.

The 8 mm. film, particularly with the new format (40 percent more information per frame), will constitute the most important development in the audiovisual field in the next few years. Following Professor Forsdale of Teachers College, it is believed that 8 mm. will be used primarily for individual instruction, although with the new format classroom projectors for groups of up to 50 in size may be expected to become quite common. As 8 mm. comes in, a technological lag problem will become apparent with the huge investment the educational system has in 16 mm. film and projectors. One way around this problem will be to develop individual instruction devices for use with 8 mm. film, particularly devices that permit student response. Considerable resistance to this development may be expected.

Multimedia-multiscreen techniques for large groups will continue to expand during the next 10 years. Lecture halls and briefing rooms will be built with such hardware requirements in mind. Automatic projection equipment will be redesigned in order to operate in gangs for this purpose, and control equipment will be developed on a miniaturized, high reliability form.

d. *Computers and the interface problem.* Since a separate paper has been prepared on computer applications to education, computers for computer-based instruction will not be discussed here. However, it may be important to point out or reemphasize that there are certain needed hardware developments related to computer-based instruction which will probably occur during the decade under consideration. These developments are referred to as the interface between the computer and the student and have been the subject of a recent study by Glaser, Ramage and Lipson.[44] In the next 10 years various ingenious interface devices will be developed so that students may receive stimulation in various forms from a computer (pictures, words, numbers, sounds, graphs), may manipulate the subject matter so presented with instruments such as light pens, and may be informed on other portions of the interface device as to progress, what to do next, etc. Until such interface devices are developed, computer-based instruction will never achieve its full potential.[45]

Essentially, at least a portion of what should go into such an interface device is the result of developments which, in the computer field, go under the general name of information display. Although the existing literature seems to suggest it, there is nothing in the educational picture which would require all such display techniques to be confined to devices requiring student response and controlling student behavior in detail. It is reasonable, in fact, to predict that information display techniques which are essentially electronic or electronic-optical in character will also be used in connection with television, other wave-propogated transmission and telephone to convey teaching materials from one point to another without elaborate response and measuring devices. As yet, with the exception of a few experiments, the techniques of information display in use with sophisticated systems, such as space and space support systems, have not been tried with education problems.[46] The next decade will see many developments in this area, including simulation.

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[44] Glaser, Robert, William W. Ramage, and Joseph I. Lipson, *The Interface Between Student and Subject Matter.* Pittsburgh: Learning Research and Development Center, University of Pittsburgh, 1964.

[45] There are, of course, other requirements for the ideal computer-teacher. See, for example, the abstract of the Case and Roe study in the *Audiovisual Communication Review,* vol. 13, No. 4 (winter 1965), p. 453.

[46] One example of such an experiment is that undertaken by Licklider. See Licklider, J. C. R., "Preliminary Experiments in Computer-Aided Teaching," in J. E. Coulson (ed.), *Programmed Learning and Computer-based Instruction,* New York: Wiley, 1962, pp. 217–239.

5. *Information Storage and Retrieval.* An area which may develop as spectacularly in the next 10 years as the language laboratory and associated teaching techniques did in the 1955-64 decade is the area of information storage and retrieval. As such, in its educational applications, it could represent an exception to the general orientation of this section.

The problem of the information explosion is well known; the fact that much information today never reaches the book stage in time but remains in the form of documents, articles, etc., has given rise to a whole new profession known as "documentalists"; experts in information storage and retrieval are calling themselves "information scientists"; and there are signs within the old-line professional library field of a deep schism between conventional librarians and information scientists and documentalists.

Obviously, new technological information storage and retrieval techniques can be (and are now, to a certain extent) applied to the problems of a conventional library. However, except for large university libraries, it does not seem likely that these techniques will make much of an inroad into school and college libraries during the next decade.

What is likely to happen is that sort of an end run will occur, and the new technology of information storage and retrieval will reach the educational system in some strength outside of the main library stream. There are several reasons for this. Again, the position of the U.S. Office of Education may be crucial; however, it is the considered opinion of the writer that even if that office were not a factor, this phenomenon would occur.

The U.S. Office of Education, however, will play a large role in this development providing present plans for its proposed Educational Research Information Center (ERIC) are implemented with sufficient funds and personnel. Operating from a center in Washington, D.C., and from, perhaps, up to 200 satellites or clearinghouses located in higher institutions and research centers of various types, microfiche (small sheets of microfilm) chips containing research documents will be supplied educational users ordering from a system of indices, bibliographies, and abstracts also provided by ERIC. This system is now underway on a small scale.

The availability of this information will create a demand for microfilm readers of various types and for equipment to reproduce hard copy from microfilm. Such readers are all—with some modification—potential teaching machines; further, the ability to reproduce hard copy presents the possibility of expanding such services to instructional materials too current to be available in any other form. Such a procedure has been experimented with in San Diego County, Calif., for some years with great success, where local industries and scientific institutions have been supplying schools with current scientific materials produced in this way.

If this development proceeds as suggested—and the probabilities are high—a full-fledged educational information storage and retrieval system may grow up outside existing channels. Further, because the hardware and services are adaptable, it is possible that a new generation of teaching machines will come into being based on the microfiche reader, thus short-circuiting a whole series of obstacles. The presence of hard copy-producing equipment might speed up the use and adaptation of newer curriculum materials, both in programed and in more conventional forms. Such a development would tend to restore a certain amount of curriculum independence to local school districts, providing staff and facilities were made available to take advantage of it. This latter development is highly unlikely. What is more likely is, as the State departments become stronger, curriculum materials will be supplied by the State departments in this easier-to-use form and curricular autonomy will be lost, not gained, at the school and district level.

6. *Standardization.* One of the strongest trends in the next decade will be a general move toward standardization, a move inevitable in any highly technical society. With respect to equipment and materials, several forces are at work that, potentially, could force standardization. The first of these is the so-called "State plan" by which many of the Federal educational programs dispense money to the States. In its most simplified form, the State submits a plan for a program, for example, dispensing funds under title III of the National Defense Education Act. Once this plan has been approved, the State, in effect, sits in control of the disbursement of the funds to its local and regional units. All the State has to do is to require standards for equipment in its plan and standardization becomes a reality. With the so-called "Compact of States" within the immediate future, providing for efficient communication between the States on educational matters, standardization could soon become national.

A second force, which has been discussed for many years but has never been released, is possible if the major cities of the United States were to combine in order to write common specifications for equipment and materials. Such cities represent a large share of the market and now contribute to the chaos in educational equipment standards by requiring annoying and, most often, useless differences in specifications. This raises the price per unit on such items as projectors, complicates bidding procedures, and localizes purchases. Economic considerations may force the end of this practice and a move to joint bidding or even centralized purchasing. Such a possibility is only a possibility and it is more likely that the provincial practices of the educational bureaucracies of such mammoth systems as New York and Los Angeles will remain at the level of their archaic city building codes. Of the two forces, the State force, even including centralized purchasing (a procedure opposed vigorously by the audiovisual industry), will probably prevail, and equipment and, to a certain extent, materials standardization will occur during the decade under discussion.[47]

At a broader level, greater standardization will be forced on the present quasi-autonomous school system than now exists through such factors as the increasing influence of Federal educational programs, even if no direct control is sought or applied; the inevitable cooperation of States and regions in educational matters; the introduction of whole systems of instruction; the possibility of a national assessment program; the reduction in the number of educational materials suppliers; the reduction in the total number of school districts in the United States; the general increase of communication; the prevalence of large-scale industrial thinking as it moves into the public sector; and the move toward computer data control.

7. *The National Assessment (Testing) Program.* Earlier in this paper it was mentioned that testing had been developed over the past several decades into a formidable subtechnology within the broader field of educational technology. The influence (some call it tyranny) of the New York Regents Examinations upon the curriculum of the schools in New York State has been commented upon for many years. Recently, this type of influence has extended throughout the Nation with the examinations of the College Entrance Examination Board, the National Merit Scholarship Examinations, the Graduate Record Examination, etc. Attention here is devoted to examinations that affect the curriculum of the schools and not to other forms of testing, such as psychological and attitude.

The next decade will see the institution of some form of national educational assessment program. The word "assessment" is used advisedly because the sponsors of the idea (essentially the new educational establishment) are proposing to combine standard achievements testing techniques with sampling techniques similar to those used in public opinion polls to assess "how well the schools are doing." Such a program would not be achievement testing in the accepted sense. A good discussion of the pros and cons of this issue may be found in a recent *Phi Delta Kappan.*[48]

Once such as assessment program is underway, it will become another powerful force for standardization. The technical capability (test construction, sampling techniques, computerized statistics) already exists. Current moves underway to make this capability operational by taking the necessary political, social, and economic steps will no doubt be successful. The claims already being made that such a program will not force a certain amount of standardization are rejected by the writer. That is not the issue anyway. The questions that remain to be answered are what kind of standardization and whether or not the standardization so created will be good or bad.

8. *Trends in Administration.* Many trends in the field of school and college administration could be singled out for projection. For example, at the brick-and-mortar level, school buildings will continue to improve and be made more compatible with the existing and developing instructional technology. Of all possible predictions in the field of administration, four are selected for comment.

The first, discussed at length in Mr. Bushnell's paper, will only be mentioned briefly. Data processing equipment and computers will become common tools for the school administrator in handling many routine problems; better decisions will be possible because of the immediate availability of better data. Centralized data-gathering centers will appear, probably as regional centers within the several States. Later, and inevitably, these will be joined into some kind of a national network.

Secondly, the most important function to be developed during the next decade will be a logistics of instruction. Everything within the new instructional technology—systems, complex use of materials, sophisticated equipment, new patterns of organization and buildings—requires formidable logistical support. The whole system will break down without it. Such support involves planning based on precise objectives and data, materials flow, equipment maintenance and replacement, backup manpower to the teacher, etc. Such thinking at present is almost completely foreign to school administrators at all levels except in a primitive form that provides sufficient pencils and sweeping compound for the year. Logistical thinking has rarely been applied to instruction; first, therefore, a theory of instructional logistics will have to be created. The pressures of the developing instructional technology will force it into being within the decade.

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[47] Materials standards are equally, if not more, chaotic than equipment standards. One of the earliest problems with teaching machines, for example, was that there were no standards for programs—either mechanical or educational. An abortive effort of a group of professional organizations to set up standards produced nothing.

[48] Hand, Harold C., "National Assessment Viewed as the Camel's Nose," *Phi Delta Kappan*, XLVII, No. 1 (September 1965), pp. 8–12; Tyler, Ralph W., "Assessing the Progress of Education," *Phi Delta Kappan*, XLVII, No. 1 (September 1965), pp. 13–16; and "The Assessment Debate at the White House Conference," *Phi Delta Kappan*, XLVII, No. 1 (September 1965), pp. 17–18.

The third projection is somewhat broader than the first two but is related to them. Essentially, it is that organization patterns will move into larger and larger units for administrative purposes and that control will become more and more a part of what is sometimes called a corporate structure. In other words, the educational bureaucracy will enlarge, with an effort to make the parts (teachers, subadministrators, etc.) interchangeable.

The precise pattern of the enlarging units may take several forms during the decade ahead. The main point is that there will be an increase in size which, of course, will in turn increase the distance between the top levels and the point of contact with students. All State systems of education will tend to become real systems instead of the semisystems now existing. The regional laboratories, the Compact of States, and other such developments mentioned above, when combined with State plans, school district consolidation, and urban growth are all forces operating in this situation. It is hard to see anything but a diminution of local control of schools in the next 10 years. This diminution will tend to accelerate toward the end of the decade.

Finally, it is probable that one or more new private school systems, national in scope, will be started during this same period. These systems will be developed by the new industries moving into the educational field and will feature highly standardized, relatively fully automated, high-quality education designed essentially for upper and upper middle-class clientele. Such a system or systems will be accompanied by, but probably not related to, similar systems of private vocational training centers. This movement, too, will be gaining impetus by the end of the decade.

The school administrator required by these and many will quite clearly be a skilled professional manager, not the Latin scholar or part-time chemist-administrator, as desirable as such characteristics seem to many people; and he will not be so much the community-oriented, faithful service club member so highly valued in some school administration circles today. Subject matter scholars, through the technique of curriculum development projects, have learned to short-circuit school boards and administrators in matters of curriculum content. Increasingly, as methodology becomes more precise within educational technology, the same effect will be achieved by psychologists and educational engineers; thus, the issue of the ideal subject matter expert or liberal arts generalist qua school administrator will become completely dead, remaining to be mourned in the columns of literary magazines. The concept of the successful community-oriented administrator will also die, although a little more slowly, and the mourning will be heard at the annual steak fry.

9. *The Research, Development, Dissemination and Adoption Syndrome and the Resistance to Innovation.* As the process of research, development, dissemination, and adoption begins to operate with force (see part II), the traditional resistance of the educational system to change will crumble at an increasing rate during the next 10 years. Some enthusiasts for educational technology of any variety have consistently underestimated the power of the resistance of the system in the past; in the future, however the timespan between idea and practice will increasingly be shortened. The current timespan between the development of a new process and its adoption by a substantial majority of units of the system has been estimated at about 35 years. During the next 10 years this timespan will be reduced to about one-quarter of that length, or from 8 to 10 years.

10. *General Developments in Educational Psychology and Methodology.* Barring unexpected breakthroughs in understanding the physics and chemistry of the central nervous system which are, of course, possible, the situation in educational psychology as described above will not change much during the decade. Cognitive structure, inquiry, structure of knowledge, creativity, and student response manipulation will still be key concepts both for pure and applied research and for the development and testing of instrumentation and materials. Increasingly, a dialogue may be expected to develop between the cognitive structure-inquiry school and the operant conditioning school; a hard core of each will hold firm, but borders will become increasingly friendly. Experiments attempting to turn one system into another, as, for example, that recently reported by Schrag and Holland,[49] will increase.

In the meantime, newer viewpoints, particularly those associated with cybernetic principles and information theory, will begin to gain momentum. A recent book by Smith and Smith may be a bellwether.[50] Research patterns using these developing theories will begin to intrigue younger psychologists. The decade will end with some newer points of view having enough adherents to threaten what will then be "old hat" psychology.

Because the psychological situation will remain unsettled, the educational engineers will build bridges of learning on an empirical basis. The decade will see a great commitment to the empirical approach in the production of instructional materials and hardware. Materials and processes will be tested increasingly on suitable populations and will be revised until they work. The engineers, of course, will use whatever can be used from the studies of the pure psychologists; further, more research will be based on realistic student populations rather than small laboratory situations from which it is difficult to generalize.

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[49] Schrag, Philip G. and James C. Holland, "Programing Motion Pictures: The Conversion of a PSSC Film into a Program," *Audiovisual Communication Review*, vol. 13, No. 4 (winter 1965), pp. 418–422.

[50] Smith, Karl U. and Margaret Foltz Smith *Cybernetic Principles of Learning and Educational Design*, New York: Holt, Rinehart and Winston, 1966.

The combination of the empirical approach and increased pure and applied research throughout the whole field of education and educational psychology represents one force that will turn a current form of thinking completely around so that it will point in the opposite direction.

The second force in operation relates to the national commitment to education as *the* uplifting force in our national life. For example, developing learning programs for such things as Operation Headstart and the Job Corps training centers are very difficult technical problems; they require, for their solution, large doses of educational technology considered broadly—methods, processes, machines, organization, skilled specialist manpower. Pious claims to the contrary, a knowledge of subject matter alone will be of little or no help in dealing with a 16-year-old illiterate from the Kentucky hills.

These two forces will combine into a pressure that will result in the rediscovery of educational methodology. From about 1950 to 1960 it was extremely fashionable to decry educational methodology as useless, as a fake medicine sold by charlatans, as something certainly not needed in the process of instruction. Those that grudgingly conceded that methodology did exist equated it with "tricks of the trade"—something that could be picked up overnight on an apprentice basis.

An illustrative example relates to the problems which led to the creation of Operation Headstart, a huge national operation designed to provide missing background for young, deprived children so that they might be ready to learn in school. It is now ironically forgotten that many critical books and articles appearing from 1950 to 1960 claimed that there was no such thing as "readiness" for learning and that professional educators, in maintaining that there was, were perpetrating a fraud on the American public. These books were read by the upper level economic group and the articles appeared in the "best" magazines. This general downgrading of methodological concepts, which resulted in its own mythology, is being attacked by events and will result in a complete destruction of this posture. Further, since control of subject matter is now secure through the technology of instructional systems, the entire dialogue between method and subject matter will be wiped out.

11. *The Buildup of the New Educational Industry.* As was indicated earlier in this memorandum, one trend of the last decade was the emergence of the science-based industries into the educational scene. The result of this in the next decade will be a pattern of power struggle, mergers, acquisitions, and new combinations, such as joint ventures between such industries, universities, and nonprofit corporations of the "think-tank" variety.

It is hard to see how the old-line publishing firms and audiovisual producers and suppliers can retain their current organization, appearance, and way of doing business. The next 10 years will see enormous changes in the educational business, which will generally be in the direction of larger, more diversified enterprises that will absorb many of the smaller companies and will force others out of business. The time of the lone salesman working out of his house for the small company and calling on a friendly territory will run out in this decade.

The existence of this larger educational industry will gradually force a change in bidding and purchasing procedures, and, hence, will influence the formation of the logistics of instruction. Such an industry will also permit more communication between the training segment (military, industrial, etc.) and the pure educational segment (schools, colleges, etc.) because materials and equipment will be supplied to both. If the pattern continues in the direction it seems to be going at the present time, these industrial giants will, through contracts, also be operating educational enterprises. The current operation of some of the Job Corps training centers by industrial groups and nonprofit corporations will be followed by the development of a general contracting capability under which such companies will provide instructional materials and services, build buildings, process data, catalog books and even hire or provide teachers and administrators for schools and colleges. Some of them may well develop their own school systems.

Part II. A Proposal for a National Research and Development Program in Educational Technology for American Education

by

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Education always has required a long leadtime in order to institute changes required by the society and the times; unfortunately, much longer than other essential elements of our society. And the leadtime of these other elements is not fixed to depend on the customary scientific and technological leadtime of the industrial sector; if it were, we would get to the moon possibly early and more probably late in the 21st century. Due to the national feeling of urgency and unlimited Government support, however, we will in all likelihood land a man of the moon within the decade.

The longer leadtime which historically has been required to bring about changes in the education and training process should also be intolerable and unacceptable to the Nation if we are to meet our national commitment. Even a crash program to increase the physical educational plant, set up new schools and curriculums, and obtain thousands of new teachers and substantially increase their salaries will not do the job the times have put upon us.

No less than a revolution in education and training is necessary. Witnessing a technological, knowledge, scientific, and population explosion we need—urgently—to witness a correlative educational explosion.

There is great concern, however, as to whether the lag between technological developments in our society and educational technology has not already fallen behind the point of possible recovery. This is not to imply that there have not been changes and significant developments. Audiovisual facilities have increased in number and scope. Multimedia approaches have been made in isolated and localized instances to attack specific educational problems. There has been a startling increase in the design and development of language laboratories. Exploratory efforts have been made in the use of 8 mm. sound film. Here and there, in isolated instances, individualized devices and study courses have been designed for individual and self-instruction. There have been vast social developments which have had an extensive impact. Education has been extended to millions who would otherwise not have benefited from it. Radio, television, and other mass media of communication and propaganda have had their undeniable effects. There have been significant advancements in the design of school buildings.

Despite these and many other developments, the fact still remains that there has been no revolutionary breakthrough in the processes of education and training. There have been no radical advances in instructional theory, methods, or in the development of procedures by which people can learn more rapidly and more effectively. Not one of the developments in technology—even closed-circuit and educational television—has had a singular, pervasive impact on the education and training spectrum itself. Newton Minnow has pointed out that the three major commercial television broadcasting networks spend more on their programs in 1 week than all the educational television stations in the Nation spend in 1 year.

The great American technological potential which has been realized in such efforts as computer technology, microelectronics, automatic data processing, information processing and retrieval, and innovations in communication technology and other scientific developments, has hardly been tapped to any significant degree for broad-impact contributions to education and training.

It is difficult to find any area in our society which has not had an exponential acceleration in its development—except for education and educational process. In the field of transportation, for example, there have been more developments within our lifetime than in all previous history. Witness the airplane, the automobile, the diesel engine. The last one alone "as a means of propulsion . . . has substantially altered the effectiveness and efficiency of all surface transportation."[1]

Our educational technology has fallen far behind the rush of technological innovations in all other fields of individual and national endeavor. The result has been a great—and growing—social and economic loss. Can instruction truly become a science? It can and must. Can a science of learning be applied to the art of pedagogy? It can and must. Technology is the application of science to art. Can the studies of the behavioral scientist concerning the fundamental processes of learning be applied to the practice of education and instruction? They can and they must. If instruction must remain an art and never become a technology, what is our alternative? Will our desperate need for an instructional technology ultimately be sufficient in and of itself to force the issue?

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*Part II was prepared independently of part I and the opinions expressed herein are the sole responsibility of the author.

[1] Clarence D. Martin. "Plan for Progress," *General Electric Forum*, (October-December 1962), p. 7.

The educational technology needed will lead to the development of those axioms which will support a science of education. Educational technology could well bring to education what Bessemer brought to the process of manufacturing steel and what Ford brought to the development of the automobile.

Until education and its correlative pedagogy develops a scientifically based technology, it will not become a profession or a science. Unless it takes on the qualities of a scientific enterprise and ceases to be an art the effort to produce a quantum jump forward in educational process is not likely to occur. A breakthrough will only be possible in areas where research and development efforts can be rigorously and widely applied.

A properly exploited educational technology would not only encourage further educational research, design, and development in automated self-instructional learning systems but also would intensively apply the process by which the new educational materials that are developed can be engineered and implemented for their maximum utilization. A thriving, robust educational technology must inevitably lead to the development of new, effective, efficient learning systems. The integrated learning systems, as such, will be made up of all materials and elements which are designed to perform a specific educational task with a high degree of reliability and validity for a specifically identified and described group of individuals. A successful educational technology will, in effect, bring to millions of students each year the benefits of the teaching skills possessed by only a few master teachers.

Jerrold R. Zacharais, chairman of the Panel on Education Research and Development of the President's Science Advisory Committee, has described the ultimate objective of educational technology as follows:

> *Great Teachers*, a collection of reminiscences edited by Houston Peterson . . . nicely demonstrates the good fortune of the student who has as his private mentor, or who shares in a classroom with other students, a teacher of exceptional talent. Now, consider the fortunes of all students, not just a few lucky ones. The task of educational research and development is to learn how to provide for all students the education an exceptional teacher provides for a few.[3]

The Zacharias panel was, among other things, concerned with the preservice and inservice education of teachers. Within this area of concern, primary attention was paid to "the development of more effective instructional materials." It is difficult to determine from reading the report, however, what finally emerged as "guidance" from the numerous meetings that were held nor how educational research and development could be brought to the point of providing a technology which would mass produce the skills of a few master teachers.

A goal of the Commission could, therefore, be to catalyze a national research and development program to, in the words of Zacharias, ". . . provide for all students the education an exceptional teacher provides for a few."

Top educational management must be mobilized to provide leadership for innovation to help solve the educational and training problems of our society. With top management support and understanding and with a climate for innovation which only senior educational management can create, the resources may be marshalled to do the job. Such senior educational leadership, however, has to be convinced. Models and demonstrations are needed, cost effectiveness studies are required—and a national institute or agency appears to be necessary to provide the data, the rationale, and the supervision.

Before the functions of such an agency may be defined, it is necessary to develop a rationale or base from which orderly development may proceed. In general, two comparable bases can be used; one is drawn from the world of education, the other from the Department of Defense.

On the educational side, Henry Brickell, the leading student of educational innovation has observed four phases to the process. A brief description follows:

> In the first phase, basic research, the question which is asked is, "How do people learn?" Findings are useless in the sense that they rarely if ever have any immediate application. More work has to be done.
>
> The second phase is program design. The question program design attempts to answer is, "How should people be taught?" This effort translates what we know about learning into instructional programs. Brickell points out that "the best designs may be expected to come from the conscious, deliberate use of

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[3] U.S. President's Science Advisory Committee, "Innovation and Experiment in Education," *A progress report of the Panel on Educational Research and Development to the U.S. Commissioner of Education*, The Director of the National Science Foundation, and the Special Assistant to the President for Science and Technology, March 1964. (Washington: U.S. Government Printing Office, 1964) p. vii.

> basic research in planning for teaching."[3] Brickell does not expect the program design to emerge from the school situation because "the typical operating school does not provide a setting rich enough in talent or free enough in professional time to generate new instructional programs."[4] I would tend to disagree slightly here. Program design could well be encouraged in the operating school situation where it could simultaneously be subject to empirical evaluation. Then if the phenomena are successfully elicited, this would provide the fodder for further basic research. Program design could be encouraged both in the laboratory as well as the operating school.
>
> Brickell's third phase is evaluation through field testing. This phase tried to answer the question, "Does the instructional program teach?" The program design is systematically tested "to find out what it will accomplish under what conditions." A broad field test is necessary because "little is known about conditions which affect learning in the school." Brickell feels, and I would agree, that "only a field test will reveal the whole range of situations in which an innovation will prove valuable." This is a crucially important phase in successful research and development.
>
> Phase four is the "dissemination" of the program after it has been successfully evaluated through the extensive field test. Brickell maintains that the "ideal circumstances for the demonstration of a new approach are those which are ordinary, unenriched, and normal." If they were otherwise—"such as the enriched conditions for new design or the controlled conditions necessary for proper evaluation [this would in the eyes of many observers] be sufficient to rob the observed program of persuasive effect."[5]

These four phases delineate the areas necessary for the catalytic actions of the studies which could be initiated and sponsored by a research and development education and training action agency with nationwide scope. Between phase one (basic research) and phase two (program design), by using the systems analysis and design approach following an R. & D. cycle of exploratory, advanced, and engineering development, the agency would produce physical models which are likely to be adopted or initiated by the complete spectrum of public and private education.

Turning now to the military sector, the Department of Defense in its weapons systems management has successfully applied an R. & D. cycle concept which it is suggested could be a model not only for the development of automated learning systems and educational technology in our society but for R. & D. in education generally.

The statement of the Secretary of Defense describing the R. & D. program to Congress can be modified to illustrate how this program can be applied to the needed education and training research and development problem stated by Zacharias.[6]

> The proposed R. & D. program may be divided into five significant steps [which should be followed if we are to effectively translate the results of education and training research into a viable educational technology, which will in turn lead to the production of validated learning systems]:
>
> 1. Basic research—the effort directed toward the expansion of knowledge of natural phenomena and our environment, and the solution of problems in the physical, biological, medical [behavioral, and social] and engineering sciences [to include the learning process].
> 2. Exploratory developments—the effort directed toward the expansion of technological knowledge and the development of materials, components, devices, and subsystems which [it is hoped] will have some useful application [in the design and development of learning systems]. Here the emphasis is on exploring the feasibility of various approaches to the solution of specific [education and training] problems, up to the point of demonstrating feasibility with "breadboard" devices and prototype components and subsystems.
> 3. Advanced developments—the effort directed toward the development of experimental hardware for technical or operational testing of its suitability for [education and training], prior to the determination of whether the item should be designed or engineered for actual service use. Here is where we begin to identify each project with a specific [education and training] application or technique, and we begin to question in depth its potential [learning] utility. During this phase we also begin to explore the costs of the most likely applications in order to determine whether the potential operational benefit would be worth the cost of development, production, and deployment.
> 4. Engineering developments—the effort directed toward the development of a particular [learning] system engineered for [institutional] use and for operational employment, but which has not as yet been approved for production and deployment. It is at this point that large commitments of resources must be made to single projects. Accordingly, before full-scale development is initiated, the specific operational requirements and the cost effectiveness of the system must be confirmed, and goals, milestones, and time schedules must be established.
> 5. Operational systems development—the effort directed toward the continued development, test, evaluation, and design improvement of projects which have already entered [or have been approved for] the production-deployment stage.

The first three steps, (1) research, (2) exploratory developments, and (3) advanced developments, constitute the area of new technology formation. The last two—engineering developments and operational systems developments—cover the area of development, test, and evaluation of specific new (learning) systems and equipment. Dissemination is a continuous process which accompanies all the steps of the R. & D. cycle. It is particularly from the second and third steps, however, that we acquire the "technical building blocks," i.e., the new techniques and critical components that we need for the development of major (learning) systems. We cannot do a proper job of engineering development, still less of operational systems development, unless these building blocks are available. Thus, the kind of (education) system we will have a decade from now will depend importantly upon how well we conduct the research, exploratory, and advanced development phases of the R. & D. process over the next few years.

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[3] Henry M. Brickell, *Organizing New York State for Educational Change*, 1961, Commissioner of Education, State Education Dept., Albany, N.Y.

[4] Henry M. Brickell, "State Organization for Educational Needs," ch. XX, in Wesley Mierhenry (ed.) *Media and Educational Innovation*, Preliminary Report, University of Nebraska in cooperation with the U.S. Department of Health, Education, and Welfare, Office of Education, Sept. 30, 1964, p. 109.

[5] *Ibid.*, pp. 200–201.

[6] Statement of Secretary of Defense Robert S. McNamara before the House Armed Services Committee on fiscal year 1966–67 defense program and 1966 defense budget, Feb. 18, 1965.

Research and exploratory developments projects need to be judged on their own merits, in relation to the advancement of knowledge of the learning process across the entire spectrum of science and technology of pertinence to the education effort. Secretary McNamara pointed out that—

> All too often in the past, new technology efforts had to be justified in terms of an end product development. This approach resulted in the initiation of large numbers of system developments for which the basic technology had yet to be created. And because of the large number of projects, the available funds were not adequate to pursue all of them at efficient and orderly rates. As a result, many ended in failure or were overtaken by new technologies and eventually had to be terminated before completion.

The model of the military R. & D. effort should be applied to the problems of innovating educational technology and automated education with certain modifications.

In applying the R. & D. cycle effort to the development of weapons systems, it should be recognized that basic (step 1) and exploratory (step 2) research, are more constrained in the military establishment than they are likely to be in education. In education, however, theoretical formulations are more likely to evolve by emphasizing exploratory (step 2) and advanced (step 3) research through feedback. Therefore, getting to step 3 in education would be as important as getting to step 2 in defense.

It also should be stressed that concurrent research and development efforts should be carried further in education than they have been in defense-oriented efforts because there is a smaller theoretical base in education and the operation as a whole is relatively less costly.

Present efforts in research and development in education and training could be similarly described. Due to a lack of an accurate accounting system, however, it would be difficult with any assurance to state, as the Secretary said with respect to the military R. & D. efforts of the past, that

> The record is replete with examples of such aborted efforts. Indeed, some 60 major R. & D. projects have been terminated during the last 10 or 12 years after costs of well over $6 billion had been incurred. The number and value of smaller cancelled developments have never been counted.

While research and exploratory developments do not necessarily have to be directly related to specific (education) requirements, a full-scale engineering development or operational systems development can be justified only in terms of its potential contribution to a national educational requirement and strategy, considering both its cost and its effectiveness, as well as the relative cost/effectiveness of other alternatives. Care should be exercised so that, as in the case of many past systems development, work is not started before consideration has been given to how the proposed learning system would be used, what it would cost, and, finally, whether its contribution to our (human) capability would be worth its cost.

Need for National Educational R. & D. Agency

The Nation needs, in essence, an organization patterned after the present Defense Research and Engineering office which would institute management controls similar to those presently in the Department of Defense. These controls have been necessary to secure the knowledge to spend *wisely* the present $6 billion plus annual R. & D. military budget. The problem is not necessarily that entirely too much money is being spent in the field of educational R. & D. for innovating educational technology and automated education; but, rather, what is being spent is proliferated in a fragmented manner. Needed is a management control system which will establish quality control and govern the expenditure of even present allocations for educational research. We need the ability to produce the pertinent and relevant learning systems which will be engineered and automated to meet the existing educational problems at the opportune moment. The present educational research funds are being expended in an extremely costly manner because of fragmentation and lack of coordination.

When the problem of making the very expensive process of military research and development pay off in national security was recognized in the Department of Defense, an approach was begun which led to the initial appointment of Dr. Herbert F. York as the first Director of Defense Research and Engineering. This put in sharp focus the importance of the scientist in military planning. We have equally to indicate the importance of the educational scientist and empirically oriented learning theorist and media specialist in the field of educational R. & D. The model suggested here for nationwide establishment is an office patterned after the present Department of Defense Research and Engineering Office (DOD R. & E.).

In the years to come, this office could refine its organization to be more responsive to rapidly changing technological advances which have implications for the development of education and learning systems. Needed is a bridge between the hardware people in educational technology and the software, or true "technological," people in education.

Systems analysis, technology analysis, and management analysis are needed. All significant areas of research and development must be evaluated in an integrated manner. An organizational effort is apparently necessary to accomplish this.

A systematic approach is needed to insure that all possible information would be available to the director of such a nationwide research and engineering development agency in education. Only then would it be possible to make intelligent decisions as to which innovative ideas should be started down the tricky road from research to prototype development.

A National Educational Research and Engineering Center (NEREC)

This national agency, independent of the Office of Education and possibly reporting directly both to the Commissioner of Education and the Secretary of Health, Education, and Welfare, would need to begin to delineate the major problems which presently are barriers to massive educational innovation on the technological front.

The first problem appears to be a need for organizational innovation. An important question that must be answered is the degree of centralization within the Office of Education or within the Federal Government that is necessary to optimize educational innovative activity in the public and private educational sectors. Basically, this will entail political maneuvering based on cost reduction data.

The first subproblem is to create a need for organizational changes within the numerous Federal, State, and local agencies conducting education and training programs in the United States. This may mean the creation of an office or directorate patterned after the present Department of Defense Research and Engineering Office (DOD R. & E.). Such a central agency could focus its efforts on the nationwide development of educational technology and the amplification of the research and development process. One approach would be to develop the "product," demonstrate its usefulness, and then organize to implement it more efficiently through the education and training system. Particularly important here is the need to sell the idea of applying systems thinking and systems philosophy to education and training problems of national scope and significance. Adult literacy and top-quality preschooling for the disadvantaged are examples.

A massive effort is needed. Not only leadership, champions, dissemination, and demonstrations are necessary, but crises as well. It has been suggested that selected educational and behavioral technology (programed instruction courses, computer-based teaching machines, automated mobile learning centers, etc.), be geared to potential crisis situations. For example, just as the use of graphite desalting plants during the Guantanamo water crisis started the chain reaction, supported by Congress, for R. & D. funding for such pilot projects around the country, similar results might be expected from contingency pilot planning for automated learning systems which would be in the prototype stage prior to the crisis (e.g., for extensive teacher training, training of subprofessionals, Watts-area-type education, medical technician training, etc.).[7]

Another area that deserves consideration is the problem of interinstitutional rivalry in education and training. This rivalry can be redirected into channels of interinstitutional cooperation. One way is through publicity. It certainly would not hurt to have the President, influential statesmen, Senators, Congressmen, and other individuals of national repute recognize and applaud those institutional programs which have demonstrated successful innovative efforts.

Third, pilot projects to demonstrate the new technologies and concepts should be supported. Even though they might appear to be piecemeal attempts, they can be coordinated to maximize the demonstration effect to other Federal agencies, departments, Congress, and leading educators in crucial positions. One consideration would be to develop projects which will show the greatest increase in performance. If, for example, one particular school system is ahead in a certain innovation, that would not be the likely place to initiate other projects. Several eye-catching projects should be carried out; perhaps training several hundred mentally retarded children. I think it is important to utilize industry as much as possible, not only because they are willing to cooperate for long-term profit reasons, but also because they can advertise and inform, while the Federal Government and HEW cannot without being accused of "waste." The Office of Economic Opportunity is successfully utilizing this approach in the Job Corps. In essence, I am suggesting that the logical approach to introduce systems thinking and organizational innovation into expanded education and training programs should also be supplemented by politically oriented action. Justice Holmes said that a page of history is worth a hundred pages of logic. History shows that important innovations are seldom logically planned.

Another problem which should be considered separately is the cost factor of the hardware; e.g., teaching machines, computer-directed classrooms, etc. The problem is to begin applying that which now exists; i.e., development, testing, and engineering, rather than basic and applied research. A cursory examination of the behavioral technology education industry indicates that much parallel R. & D. has been occurring in the private sector and in universities (e.g., PLATO II). The majority of these companies also realize that the $34 billion education industry is among the fastest growing markets in the economy; hence, most companies are willing to forego present profits merely to get a foothold in the market. As a result, projects sponsored by Government agencies should have good bargaining power in that most companies would welcome the opportunity to prove their hardware and build up their name in the market. Similarly, the general tendency for federally financed R. & D. contracts to let the contractor retain title to patented inventions gives additional bargaining power to the Government agency.

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[7] Charles Blaschke in personal communication to G. D. Ofiesh, Oct. 1, 1965.

A second consideration regarding hardware is how much standardization is wanted. One might expect that mass production would lead to lower production costs. Yet, counterbalancing this is the fact that rapid obsolescence will probably be occurring and that standardization, while an initial impetus to innovation in period 1, could well be an obstacle in period 2.

Studies are needed and should be initiated by the Federal Government to specify the latest scientifically derived procedures needed to develop the structure and content of specific education and the development of educational systems. Procedures need to be developed which will provide school administrators assistance in reviewing and evaluating would-be innovations, present educational programs and learning and instructional systems in terms of their ability to produce the required kinds and quality of achievement and student performance.

An awareness of the possibilities of extensive R. & D. efforts in educational technology was lucidly expressed by Dr. Simon Ramo, president of the Bunker-Ramo Corp.:

> . . . perhaps the most important area of technology that remains before us for the next several decades is the extension of the human intellect by electronic devices and the consequent creation of a much greater amount of brain power for the Nation.[8]

Not only attorneys, physicians, engineers, legislators, librarians, and schoolteachers—but teachers and school administrators, in Ramo's words,

> could some decades from now use a console on their desks, much as today we use telephones to obtain information to check out decisions made against statistical situations, to diagnose illnesses by putting in the facts and having pertinent cases brought quickly to their attention, or to check actions they wish to take between individuals or corporations. Information could feed into the console, analyses made, decisions altered, all in a split second.
>
> . . . with that kind of intellectual, informational, and technological accommodation the brainpower of the Nation would be greatly increased. [With respect to education] the possibilities are, of course, obvious, and it is possible, in effect, to get the equivalent of extending the brainpower of human educators manyfold, just as a physician does a better job today because he has the cardiograph and the X-ray machine and the blood tests and the electroencephalograph, in a similar fashion the educator will be able to do a better job by having records at his fingertips not only concerning the individual student, but also concerning what the student, in accordance with the tests that he has taken, should apparently be taking next, and what exceptions seem to apply, so that all of the items so difficult to remember, so difficult to get information on, on millions of students will be available.[9]

Developments having national scope are needed to presage the need for a coordinated nationwide effort in research and engineering development programs for educational technology.

Immediately steps must be taken to establish a clearinghouse for the exchange of information and ideas on all new developments in instructional technology.

Along with the clearinghouse, a major effort must be made toward "the application of the systems concept [which] is . . . mandatory in educational and training research.[10]

The "systems approach" to education would not take all of basic education and training and attempt to translate the results into educational technology. Rather, it would review basic research studies to isolate those results which have relevance to a specific operational education and training requirement. Once relevance is determined then a program of exploratory development is instituted. Where the results of exploratory development tests warrant it, an advanced development program is then followed. If results of these tests continue to be favorable, they should lead eventually to an extensive engineering development program which would produce an infinite number of education and training systems. These would be used not only by all the institutions and Federal agencies but by any school system or vocational school desiring to do so.

The Office of Education and other institutions cannot expect the research scientists to be the primary change agent in our society. Research scientists can be urged to innovate as they have been on numerous occasions. They have a case, however, when they argue that they have been charged with conducting the research and not with its application; that search is for truth and utility. If those who have purchased the research do not wish to make use of the results, that is their affair. Holding the research scientists to his commitment and charge to do an acceptable job of designing and conducting the research, the Nation must organize or institute procedures for translating the results of valid research into viable technology and action.

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[8] Air Force Association Aerospace Seminar, Washington, D.C., Sept. 5, 1964.

[9] *Ibid.*

[10] J. H. Swann, "A New Approach to Training Requirements Research to Improve Mobilization Readiness," U.S. Naval Personnel Research Activity, Bureau of Naval Personnel, Washington, D.C., May 23, 1962.

It would be extremely difficult at this time to find any person, office, or agency within the national structure charged with the mission of research surveillance in education and training to identify research studies and results which deserve exploratory, advanced, and ultimately engineering development efforts. No one, apparently, is doing this for the Commissioner of Education or for the Secretary of Health, Education, and Welfare. To this writer's knowledge no one has been charged at any departmental or Federal agency level for insuring that even validated materials of instruction, where they have been purchased and produced, are utilized where applicable.

Although research efforts to date have been significant, necessary, and encouraging, much more is needed. Maj. Gen. Donald R. Ostrander has pointed out that there "must be a communication link between the person who creates new knowledge and the person who recognizes a use for it; and between that man and the people with problems to solve."[11] The best communication link that can be provided is the engineering development of innovations. A "wind tunnel" for the testing and development of education and training systems is needed. The wind tunnel does not fill the same function as a test tube. This effort, building on the information provided by a clearinghouse or a group such as the Educational Media Council and other information disseminating activities, will most likely produce the test and *demonstration* models for the needed innovations.

Needed on a national level is a research and engineering development center for education and training innovations whose function will be to catalyze instructional research projects as they may be applied to both theoretical and practical education and training problems. This activity would not replace other educational research organizations but would supplement their activities and provide direction in crucial areas.

The ultimate aim is to see as much opportunity for innovative research in training and education (in addition to efforts specifically directed at some specialized problem) as the Nation now takes in aerospace, communications, and other areas. This effort will be taken when the Nation recognizes that an effective system of education and instruction is as critical to national survival and progress as effective weapons systems, and that the savings which could be attributed to research and engineering development in instruction should more than cover the cost of that research and would be the criterion for a typical support system.

It is not a part of this argument that the Office of Education and other agencies have not been sponsoring or conducting adequate research programs in education and training. On the contrary, a great deal is done and much of it is very good research. It is the thesis, however, that literally nothing has been done to translate education research findings into useful and meaningful applications. Further research efforts have been scattered, uncoordinated, and seldom organized as complete systematic approaches to problems or systems analysis oriented even within a given department or State or local school system.

The problem is further aggravated by the lack of any national agency assuming any responsibility for the universal adoption and adaptation of proven innovations in education and training. The customary view of the R. & D. investment in training and education is localized rather than one which would maximize the return on the R. & D. investment by preventing duplication and triplication. Nor is the entire national education and training spectrum regarded as fertile ground for the adoption of educational training innovations and automated learning systems.

An engineering development program of wide scope throughout the Nation will affect the entire field of education and instruction both in the United States and abroad. The nationwide exploratory study of programed instruction technology has not only contributed handsomely to the growth and development of instructional technology in this country, but the interest in programed learning and the resulting teaching machine technology in such countries as England, Germany, Sweden, Canada, and numerous others can be attributed in great measure to the efforts in the United States.

The competition in educational technology between the Communist and the free world will intensify in the years to come. The United States can play a strategic role on behalf of the free world in this competition.

The emphasis that has been placed upon education and training by the Communist world does not need repetition. It has been recognized that the Soviet Union is devoting considerable research to the development of educational and teaching machine technology and to biocybernetics. Cybernetics, with its emphasis on potential for computer-based instruction, has received top level government support in the U.S.S.R.

A unified plan for the research and development of programed instruction technology for 1964–65 was prepared by the Ministry of High Education and Specialized Secondary Education and the U.S.S.R. Academy of Sciences. The Rand Corp.

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[11] Address by Maj. Gen. Donald R. Ostrander, Air Command and Staff College, Maxwell AFB, Ala., June 10, 1964.

report on Soviet education concluded that "much of Soviet planning, economic as well as military, hinges on computer technology and its applications" of which teaching machines are one example.[12] The prospects for automation, for example, to provide a basis for producing educational innovations and to accelerate the processes of education and technical training are apparently appealing to the Soviets.

The high costs of existing education and training programs and proposed innovations, the need for matching the education and training technology of Soviet communism, and the potential benefit to all training and educational agenices in the free world make the requirement for a new administrative structure whose business is educational innovation and automated education an imperative.

The center would be a bridge established through the present organizational structure which would span the present conduct of training and education at the user level and a revitalized and coordinated R. & D. effort in training and education. The center would have some very definitive goals during its initial years. Among other things it would

- —Initiate, promote, and catalytically accelerate the development of education and training innovations and automated educational system models.
- —Shorten substantially the present leadtime between basic and applied research, test, and evaluation, and the point of operational implementation by the Nation's education and training institutions.
- —Establish procedures for assessing education and training innovations in terms of:
  - a. Specific reductions in training/education time or appreciably more training/education per capita within a given time frame.
  - b. Substantially higher achievement by substantially larger numbers of students in their skills and knowledge tests.
  - c. Superior achievement and longer retention of these skills acquired through the innovation.
- —Establish, coordinate, and monitor demonstration projects in educational and training systems which have nationwide application.
- —Maintain close liaison with national and regional educational research and media development centers.
- —Serve as a focal point for nationwide interest in and study of biocybernetics and educational cybernetics.

In summary, the requirement exists for a new and pressing national agency large in dimension, impact, and promise. The Federal Government should establish an interagency structure that would do for the field of education and training what the National Institutes of Health are doing for the betterment of the Nation's physical and mental health. It is quite apparent that within the fast changing and growing complex of national manpower and education and training requirements and resources, there is no Federal focal point providing either an overview or overall management of Government-supported efforts in educational R. & D.

The proposal centers upon three missing links in the national education/training chain which have been identified as three complementary functions; namely, a clearinghouse function, a research and development coordination function, and a policy recommendation function (implicity flowing from the first two functions). The center would function in the areas of programed instruction, educational television, films, and other audiovisual materials and devices, special instructional devices (including computers), instructional methodology in general, and training and education programs as such. Emphasis would be placed on educational technology. The center would not presume any authority as a control agency.

An immediate objective would be for the President to establish an interagency task force to produce broad policy guidelines and implementation plans through which the proposed center would function and discharge its assigned responsibilities. Two Presidential committees exist, either or both of which would be appropriate forums for establishing the task force, namely, the President's Federal Interagency Committee on Education, and the President's Committee on Manpower. It is not illogical to suggest that both of these committees could jointly call upon the various agencies concerned to appoint members to the interagency task force which should be established. Or would not the President himself lend a sympathetic ear to the idea and consequently order the formation of a task force to determine how best to achieve the educational innovation center concept? The concern is with a basic concept for structuring a viable organizational system that would in large measure insure balance, quality, coordinated direction, economy, and effectiveness at the very foundation stones of any Great Society; namely, training and education.

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[12] R. E. Levien and M. E. Maron, *An Evaluation of Soviet Developments and Use of Teaching Machines*, The Rand Corp., April 1964.

EDUCATION IN THE UNITED STATES: STATUS AND PROSPECT

A Series of Reports
Prepared for the Commission

AUTHORS

CHAPTER 1. *Summary and Recommendations*—Prepared by all contributors.

CHAPTER 2. *Expectations and Goals for American Education*—Prepared by L. A. Van Dyke, University of Iowa, Iowa City, Iowa.

CHAPTER 3. *Adult Education and the Learning Society*—Prepared by Howard Y. McClusky, University of Michigan, Ann Arbor, Mich.

CHAPTER 4. *Education as Preparation for Employment: Broadening the Base of Responsibility*—Prepared by Kenneth B. Hoyt, University of Iowa, Iowa City, Iowa.

CHAPTER 5. *New Dimensions for Civic Education*—Prepared by John H. Haefner, University of Iowa, Iowa City, Iowa.

CHAPTER 6. *Compensatory Education for Culturally Disadvantaged Children*—Prepared by Donald L. Carr, University of Iowa, Iowa City, Iowa.

CHAPTER 7. *The Psychology of Learning and A Science of Education*—Prepared by Lowell A. Schoer, University of Iowa, Iowa City, Iowa.

CHAPTER 8. *Educational Policy, Organization and Structure*—Prepared by Robert W. Marker, University of Iowa, Iowa City, Iowa.

CHAPTER 9. *The Role of the Federal Government in Education*—Prepared by Howard R. Jones, University of Iowa, Iowa City, Iowa.

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Education in the United States: Status and Prospect

Chapter 1. Summary and Recommendations

I. INTRODUCTION

This monograph consists of a series of position papers designed to bring perspective to American education and to present recommendations leading to its improvement. It is written at the behest of the National Commission on Technology, Automation, and Economic Progress, and provides background material which may be used by the Commission in making its own recommendations relative to educational programs. The author of each chapter is responsible for the material appearing therein.

A decision was made at the outset that the content of the papers should not be narrowly construed, and that all topics discussed need not bear a direct relation to technology, automation, or economic progress. Rather the task was viewed as one of positing directions to be taken by education as it assumes an increasing role in the advancing society.

This chapter summarizes conclusions and recommendations emerging from the separate papers. The reader is urged to read the papers which follow this chapter, as the summary statements are more meaningful in the context in which they are developed in the separate chapters. In addition not all of the viewpoints presented can be incorporated in this first chapter.

II. CONCLUSIONS AND RECOMMENDATIONS

Goals for American Education: Continuing Education

1. The primary unifying goal for all education in the United States should be individual opportunity—opportunity for all persons to develop their talents and fulfill their aspirations. All individuals—regardless of religion, ethnic origin, economic status, age, or place of residence—should have an opportunity to obtain as much education as their abilities permit.

2. The fundamental motivation undergirding education is freedom to learn. As an individual matures he should have increasing freedom to choose from among many types of educational opportunity. Education in a democracy begins with a basic program for all children in the primary grades and gradually increases in degree of flexibility and freedom of choice as the student advances. Adolescents cannot be compelled to learn, but they can be motivated to learn if they are free to learn.

3. Of course, education must contribute to the well-being of society. Society's special needs in such categories as employment, intergroup relations, national defense, public health and safety, housing, law and justice, and conservation can best be met, however, by an educated people who have free choice and social wisdom and a strong sense of social responsibility. If the end product of the educational process is an informed, rational, and responsible citizenry, societal needs will be met.

4. Nothing short of education throughout the entire life span is sufficient to provide individual fulfillment and mastery of the environment. Because cultural changes which once encompassed centuries occur now in a decade, man's ability to manage change requires continuing education throughout life. The general educational level of the public governs the pace with which new knowledge can be absorbed, adjustments made to new developments in science and technology, and solutions reached to concomitant social, political, and economic problems. There is no such thing as

terminal education. Lifelong learning is a universal necessity since we are living in a learning society.

5. This lifelong learning is cast in both formal and informal learning situations. Not only does learning occur in the class, the extension course, and the lecture series; but it also takes place in individual reading, the television program, the ward meeting, the coffee klatch. The system of public education, however, should provide for a comprehensive program of educational opportunity for persons of all ages and of varying educational attainments. The dropout must find a program encouraging reentry, the college graduate an opportunity to probe more deeply into a special field or broaden his general education. A system of education that is open-ended with freedom for mature students to enter, leave when alternative experiences seem more fruitful, and then reenter, is entirely possible. Such a system is on the way to becoming a reality when State systems from kindergarten through the university are planned on a coordinated basis and include community colleges serving their multipurpose functions.

6. A well-balanced elementary and secondary education is minimal for each citizen both in terms of the needs of society and the best interests and personal satisfactions of individuals.

7. As our Nation has grown and our culture, economy, and Government have become more complex, the importance and scope of general education have increased enormously. Not only have elementary schools, secondary schools, and colleges gradually expanded and strengthened their programs, but professional and technical schools are devoting larger blocks of their curriculum to general education. This is basic to the development of rational powers, responsible ethical values, and broad cultural interests.

8. This view of general education suggests elementary and secondary programs less prescriptive than at present, with more liberal time allocations and more flexible programing of pupils; and greater individualization of instruction, with more concern for what happens to pupils and less for the acquisition of unrelated bits of knowledge required by many schools.

9. Increasingly the general public is becoming aware of the wide ranges in capacities among youth and desirous that our educational establishment make better provisions for them. Lay support has grown each year for guidance services, ability grouping, nongraded programs, honors courses, multitrack curriculums, compensatory education, and adult continuing education.

Preparation for Work

10. For most secondary school pupils, vocational training in the sense of developing entrance skills for a job should be deferred to the posthigh school years. Vocational education should become increasingly general, exploratory, and guidance-oriented in the high school. Some preparation for semiskilled, clerical, and service occupations, with accompanying on-the-job training, may be desirable for pupils with limited academic ability in order to motivate them to remain in school; but at most, this would involve a small percentage of any student body.

11. Opportunities for education for the world of work are many and varied, and diverse institutions and agencies are needed to meet the differing requirements of the many vocations and professions. Apprenticeship, cooperative work-study programs, area vocational schools, private vocational schools, community colleges, colleges and universities all have roles. Business and industry also bear responsibility for vocational preparation, particularly for upgrading and updating employees. Increasingly, programs sponsored by corporations are being meshed with those of educational institutions.

12. The public area vocational school should provide vocational training in trade, technical, and business occupations at the skilled-worker level. The primary emphasis of the area vocational school should be on initial youth training for employment, with a secondary emphasis on adult retraining. The area vocational school should anticipate that most of its students will be high school graduates. Provision must also be made for some high school dropouts, college transfers, and unemployed workers.

13. The community college should provide high-level technician and semiprofessional training as the primary emphasis of the vocational education part of its program. Both community colleges and area vocational schools should be regarded as part of the State's educational system as well as being regionally oriented. Except for programs demanding large numbers of workers, vocational training opportunities in the different institutions should complement rather than duplicate each other. Mobility between institutions should be encouraged, and a student should be able to enter the program of his choice regardless of the location in the State where the program is offered. Thus dormitories will be needed at many area vocational schools and community colleges.

14. With respect to colleges and universities, there is a great need and sound justification for supporting still greater expansion of graduate programs

as preparation for employment, with relatively more general education emphasized in the undergraduate years.

15. Much more needs to be done to help college dropouts plan for alternative ways of securing education for employment.

16. Adult vocational education must be considered an important aspect, not an incidental service, of education at many levels. For unknown thousands, new techniques are making old skills obsolescent and new skills mandatory. Many workers show great resourcefulness in improving their own performance, or in moving to new jobs. But great numbers of the displaced are forced to turn to work far below the level of their competence or are cast aside from the main stream of productive effort.

17. Adult vocational education in elementary and secondary school settings should concentrate largely on providing basic education in fundamental academic skills and providing training in semiskilled and service occupations. Adult vocational education in the private school and the area vocational school should provide both upgrading and updating instruction at the skilled-worker level, and remedial basic academic instruction should not be a major instructional objective in such settings. The community college plays a unique part in the technical and semiprofessional areas of vocational education. The colleges and universities have a vital updating role in adult vocational education, particularly in the professions. This function deserves wider recognition.

18. Many apprenticeship programs are rigid and inflexible. In preparing for some occupations, greater willingness should be shown to experiment with alternative approaches to learning required skills. More attention should be paid to the selection of apprentices on objective bases related to probable success in the vocation. There should be more meaningful integration with formal education offerings.

19. Vocational training programs developed under the Manpower Development and Training Act should serve a different clientele and not compete for students with similar programs in public area vocational schools. The assumption should also be tested that unemployed workers drawn to MDTA training programs through financial subsidies will, in fact, become motivated to enter occupations for which training is provided.

Education for Citizenship

20. A major function of education is to develop citizens capable of achieving and maintaining social unity in a period characterized by the pressures of the advancing technology, the population explosion, increasing urbanization, the changing role of Government, and a new international posture. Today's citizens must be economically literate, politically informed, and committed to the values of a free and open society.

21. The educational experiences provided by the program of civic education in the schools should include:

a. Consideration of the social and cultural effects of an expanding science and technology;

b. Inquiry into the causes and results of population pressures, the realignment of social classes and castes, and the nature and exercise of power;

c. Knowledge of the processes and problems of production and distribution;

d. Understanding of the factors which sustain the democratic process in the United States: Due process of law, the two-party system, the role of pressure groups in politics, means of democratic decision making;

e. Understanding of the changed nature of interdependent relationships around the globe and of the conflicts and problems that arise when differing cultural systems are brought into continuing intimate relationships;

f. Realization of the importance of common assumptions and accepted values for personal as well as social adjustment; dedication to the values and ideals which undergird a democracy.

22. Realistic civic education must lead young people and adults to an understanding of the nature of the new international relationships and develop leaders capable of providing wise guidance as inevitable stresses and strains in international relations occur.

23. New avenues of personal satisfaction in the use of leisure hours must be opened to children, young people, and adults. Educational institutions can emphasize library resources, community service, handicraft skills, the fine and practical arts, individual sports, and various other forms of recreation and use of leisure time as avenues for self-development.

24. Assimilating disadvantaged groups into American social and political life is a basic national problem. All groups need a sense of identity with the civic culture of America.

Compensatory Education

25. The disadvantaged child's educational and cultural handicaps are primarily the result of dis-

parities between his subcultural background and the expectations and demands of the schools and society in general. The deficiencies are social and economic in origin and can be modified through new experiences and learning provided through special compensatory educational programs. A number of compensatory programs have been developed on an experimental basis at the preschool, elementary, junior high school, high school, and college levels. In addition to programs under local community and State sponsorship, recent Federal legislation has given greatly increased support to health, education, and welfare programs affecting disadvantaged children.

26. Greatly expanded local, State, and national support must be given to research and special training programs to prepare teachers, administrators, psychologists, counselors, social workers, and health personnel to work with the disadvantaged.

27. The broad attack demanded by the needs of disadvantaged children requires some fairly extensive modifications of our existing educational program. These modifications should include lowering the age limits of community school programs to provide preschool experiences for disadvantaged children on a year-round basis. It is hoped that early intervention will make a significant difference in the youngster's educational performance throughout the course of his school career. While comprehensive data on the permanency of results of early intervention are not yet available since most of these projects have been in operation only a short time, the weight of fragmentary evidence tends to support the efficacy of such programs.

28. The largest and best-publicized effort in compensatory education has been the Head Start Program, initiated during the summer of 1965 as a facet of the antipoverty program. This project, administered by the Office of Economic Opportunity, was designed to help prepare disadvantaged children for entry into kindergarten and was adjudged so successful that it has been placed on a year-round basis. The program has been given widespread endorsement and has elicited communitywide involvement.

29. Compensatory education should not be limited to preschool and elementary school levels. The results of programs for junior high and high school-age young people are also promising. However, more intensive efforts must be made in the case of older youngsters and adolescents because of the cumulative nature of their deficits and educational failures.

30. Planning for children of different age levels must insure continuity from one grade to the next. Crash programs with little provision for systematic follow-through are of questionable value from a long-term point of view.

31. Compensatory programs which are focused primarily on educational and psychological development should be centered in the schools, with high priority given to interagency participation, communication, and cooperation. The school has been, and will probably continue to be, the only agency within the community which has sufficient long-term contact with all children necessary to exert a lasting influence on their lives. From the standpoint of economy of facilities and personnel and on the basis of knowledgeability, the schools are in the best position to launch an effective attack on the problems of disadvantaged children if given adequate support and assistance.

32. In addition to the several million educationally and culturally disadvantaged children in the Nation, another 10 to 15 percent of the school-age population consists of children handicapped to such an extent that they require special educational provisions in order to attain maximum development. Included in this group are children who are mentally retarded, emotionally disturbed, crippled, or handicapped by speech, hearing, or visual disorders. The development of special educational programs is lagging in many areas of the country although it is clear that the majority of the handicapped can lead economically and socially productive lives if they are provided with special educational programs. The expansion of such programs is necessary from an economic, social, and humanitarian point of view.

Research in Education

33. Extended traineeship programs are needed to prepare educational researchers. These traineeships should be available not only for people who are interested in research methodology as a major area, but also to those who have a major interest in a subject-matter field along with a strong research concern.

34. Students, perhaps even advanced undergraduates, should be involved in educational research being carried on by individual staff members.

35. Teachers should be trained in fundamentals of research design through short-term workshops. Such workshops could not only stimulate teachers to do research, but also make them more discriminating consumers of research.

36. A more active search for a better criterion than chronological age for class placement should be given a high priority.

37. Research and training funds should be made available to develop individuals whose specific function would be to bridge the gap between basic behavioral science and classroom practice. They should be knowledgeable not only about the behavioral sciences but also the practical problems of education, and should design research programs to relate to one another.

38. Basic research which leads to the development of curriculum materials is needed. Continuity could be assured by having a single researcher carry out or direct the complete research sequence, from basic research through the development of materials.

39. Continued research is needed in the utilization of teaching aids made available by educational technology. Programed learning, computer-assisted instruction, and audiovisual media offer possibilities for meeting individual differences and enriching instruction. However, educational technology can only make a contribution to classroom practice to the extent that knowledge of the learning process permits adequate programing. In this regard these devices are no different from any other teaching devices or procedures.[1]

Development of Educational Policy

40. Better means of dealing with educational policymaking at State and national levels need to be devised. The "Compact for Education" recently adopted establishes a mechanism for sharing information on educational problems and solutions among the States and for hastening the adoption of promising practices. States join the Compact voluntarily, each agreeing to establish an Educational Commission to support the Commission financially according to a fee formula. Serving on the Commission are seven members from each State, including the governor and two State legislators, with the others drawn from the lay public and professional education. A 30-member steering committee (including 10 governors) employs an executive director and gives direction to a commission staff which will prepare working documents for consideration by members of the Compact. A suggested initial project is assistance to each State to develop a master plan for its higher education program.

41. At the national level, many different proposals have been advanced for advisory committees in relation to various aspects of education. Under the Elementary and Secondary Education Act of 1965, the President appoints a National Advisory Committee on the Education of Disadvantaged Children to review the administration and operation of title I and appraise its effectiveness. The Commissioner of Education, under title III, is to establish in the Office of Education an Advisory Committee on Supplementary Educational Centers and Services. For the overall administration of the Act, he may appoint an advisory council of 10 members who may be consulted with respect to his functions under this Act. In the series of papers which comprise this monograph, different authors have advocated the establishment of national study groups and advisory councils. No effort has been made to correlate these proposals, but two points should be stressed:

> a. In the various national committees which will be established by both governmental and professional organizations and under the auspices of foundations, the intellectual resources of the Nation's colleges and universities should be fully utilized. Whether the problem be removing disadvantage in the urban slum or reorganizing the secondary school social studies program, the knowledge and insight of those in academic life should be sought.
>
> b. There is great need for a small national committee of informed and prestigious educators to study on a full-time basis the direction educational policies should be taking. A Council of Educational Advisers to the President is recommended to be patterned after the Council of Economic Advisers established by the Employment Act of 1946. The Council would have no executive or legislative power, but its reports would provide the Nation with an assessment of the progress being made in education, outline strengths and weaknesses, cite trends, advance proposals for educational improvement, recommend national educational policies and objectives, and promote cooperation among the many governmental agencies which have a direct dealing with the educational enterprise.[2]

The Role of the Federal Government in Education

42. Education has long been regarded as a State function with State statutes establishing local school districts to assist in carrying out the educational program. There are national needs that must be met by education, however, and education must be a servant of national purpose. While the State's basic responsibility for education should not be altered, the Federal Government is becoming a new force in achieving educational purposes. The goals for education at local, State, and National levels tend to be consonant. Required is recognition that a local-State-Federal partnership is essential to meeting today's demands.

43. Proper financing of education requires substantial revenues from all of the partners. Local and State financing alone is not equal to the task. On the part of the Federal Government, aid should

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[1] This has not been elaborated in this monograph since the Commission has available to it working papers on the applications of technology to education.

[2] This recommendation was advanced and endorsed in working session of the writers of the papers in this monograph. It was not realized until after its formulation that this proposal had been advanced by William Benton and others as long ago as 1959. Cf. Committee for Economic Development, *Raising Low Incomes Through Improved Education*. New York: Committee for Economic Development, 1965, p. 42.

be structured so that States establish "foundation" programs whereby school districts provide at least a minimum program of educational opportunity for all children. Thus, a large measure of Federal funds would be distributed on a general aid basis.

44. Until serious gaps in educational needs are overcome, categorical aid will also be required; for example, special assistance to alleviate the handicaps faced by the culturally deprived is fully warranted. Vocational education programs can become more responsive both to the needs of individuals and available employment opportunities. Financial assistance which stimulates State educational agencies and local school districts to innovation may result in educational results of far greater value than the sum of "seed" moneys invested. While general aid should be a long-range commitment in which the tax resources of the Federal Government become more available to education, categorical aid should be stimulative, to be withdrawn when the objective is achieved or when services can be incorporated within the foundation program.

45. The U.S. Office of Education has recently been reorganized to strengthen its leadership role, place increasing emphasis on long-range planning, heighten its function in stimulating research and curriculum revision, and reinforce channels of communication with State departments of education. This will make the office a more effective Federal agency. Continued strengthening of the Office of Education is complementary to the establishment of the National Compact for Education. The establishment of a Council of Educational Advisers should not threaten or hamper the leadership role of the Office of Education any more than the Departments of Commerce and Labor are threatened by the Council of Economic Advisers. The task of education requires the combined concern of many bodies and forces.

46. Better coordination of the different educational programs carried on by more than a score of Federal agencies is needed. The dollar value of programs not under the direction of the U.S. Office of Education exceeds $1 billion annually. Some of these programs undoubtedly should remain within their sponsoring agency, but there should be increased communication and coordination between Federal agencies.

47. The national assessment project now underway deserves encouragement. Dependable measurements are needed about the broad outcomes of the school program and the extent to which various "inputs" fed into the schools result in better achievement. The task is of great magnitude and calls for measuring instruments not yet devised. Sampling which will not identify particular pupils and school districts will be needed, yet sufficient data should be provided to determine where progress is pronounced and under what circumstances achievement is blocked. While the assessment project must not lead to a rigid curriculum determined at the national level, opposition to the program because of possible abuses overlooks the promise of some of the most significant research planned for this decade.

III. EDUCATION: AN INVESTMENT

Many of the conclusions and recommendations in this monograph emphasize that it will be costly to retool educational structures and processes and increasing expenditures for education will be necessary. First and more importantly, these increased expenditures are justified because they are requisite to the development of educational programs which enable people throughout life to realize their own unique capabilities. Secondly, expenditures for education are not just expenses "down the drain." In recent years, studies have shown that the returns from education, even in dollar value in individual earnings and national income, approximate the returns from other types of dollar investment. The term "human capital" has been coined, and it is this type of capital investment which seems so essential in a societal system depending to a great extent on a technology for its economic well-being. Education is an investment with both tangible and intangible dividends.

In concluding this summary chapter, it must be stated that limitations of time and space prevent a more extensive treatment of the various facets of education which impinge with dramatic force on contemporary society. Of course, there are sins of omission in the writing of this monograph. As far as the sins of commission, the writers hope that the points of view set forth will assist the Commission and others who read these pages to define the major issues of education and the stands which must be taken.

Chapter 2. Expectations and Goals for American Education

I. INTRODUCTION

Any group studying goals of American education is bound to face the fact that no unified system of education exists. We do have a wide variety of rambling systems and institutions and a diversity in control, support, and clientele. Included in the American educational system are public, parochial and private schools; elementary, secondary, postsecondary, and higher institutions; State, local, and Federal systems; and programs operated by private enterprise. In addition, philanthropic, youth, labor, fraternal, and civic organizations sponsor a variety of educational projects.

These institutions have but few common characteristics: They operate within the framework of our democratic society, they seek to teach something to someone; and usually, they employ teachers. Some general expectations may exist for all of these, but their special functions are exceedingly varied.

If we grant that the cornerstone of our democracy is a basic commitment to individual worth, personal liberty, and equal opportunity, then the primary unifying goal of education is individual opportunity—that is, opportunity for all to develop their talents and fulfill their aspirations.

Related to but dependent upon the principle of individual opportunity is the concept that education should contribute to the well-being and improvement of society. But the relationship of the individual to society is a subject of endless dispute. The nature of this relationship is inconstant; in times of national crisis, measures to preserve the security and well-being of society take precedence over the apparent interests of individuals. In education, too, the implementation of this principle must be adapted to the maturity and sense of social responsibility of individuals.

Apart from the urgencies of a national crisis, the underlying principle for education in a democracy must be opportunity—for individuals to realize their ambitions, gain personal satisfactions, develop their talents, and enjoy freedom in learning. Inherent in this is a gamble that great numbers of individuals with a wide variation in capacities, interests, and background will attain a social wisdom and sense of social responsibility strong enough for them to make choices and act in a manner which will protect and advance society.

While there have been times when we have vacillated from this principle, legislative action, financial support, local policies, judicial rulings, and popular discussions over two centuries attest to its wide acceptance and great durability as a basic guide for education.

However, while there is agreement on broad principle, we seem to lose perspective in implementation. Imbalances, dislocations, crises, and conflicts develop and we are forced off course. We flit from one stopgap measure to another, accomplishing little, and confusing a large number of students in the process.

School boards get pushed into censorship by charges of communism in the schools; faculties become enthusiastic about the gifted and neglect the not-so-gifted; campaigns are launched to sell education to potential dropouts without facing up to conditions that cause dropping out; and Federal aid fosters major expansions in science and vocational training at the expense of the arts and humanities. Distracting imbalances in the curriculum result, and the basic principle of individual opportunty becomes obscured as we apply poultices to the sores.

This protest against imbalance and loss of perspective does not negate the vital role of education in meeting social needs. Nor does it minimize the realities of a national emergency. However, national *demands* seem to become confused with social *needs*, and in our rush to meet demands in one area we lose sight of needs in others. Current manpower demands may well point toward the expansion of training facilities for engineers, scientists, and technicians; but society may also need an equal or even greater effort for providing nurses, teachers, social workers, clergymen, and plumbers.

There is a persistent danger in selective programs designed to meet special social demands: individuals may become submerged in a mass of statistics. Aside from the urgencies of a national emergency, education can best contribute to the strength of society by focusing on developing strength in individuals. In order to achieve this, education must be well balanced and provide maximum opportunity for individuals.

American education must keep projected changes in focus with public expectations and long-range goals. Accelerated changes in technology will quite clearly result in accelerated changes in population, standards of living, group relationships, manpower needs, governmental organization, cultural interests, economic problems, and leisure and recreational patterns. And these technological changes are bound to be accompanied by immense and varied demands for changes in education. But before we get caught up in conceiving hasty answers to waves of criticisms, educators, representatives of government, and laymen would be wise to restudy and clarify expectations and goals for education, and construct a valid frame of reference for judgments about future plans and proposals.

The unifying principle of education is individual opportunity along with the dependent concept of social gains through individual growth. Beyond these, educational goals can be identified as either (1) implemental functions which society expects of educational agencies, or (2) cognitive outcomes and changes in attitudes and behavior which it hopes to develop in students through educative experiences. The provision of continuing education is a function, a special service which the public expects of education; civic responsibility is an objective expected to be achieved through instruction. This chapter will be concerned with the functions of education, since these have broader application for decisions than statements of objectives.

II. FUNCTIONS OF EDUCATION

Legislative action, financial support, local policies, judicial decisions, and personal discussion indicate that Americans believe education has the following functions:

1. *Providing equal opportunities.* Americans have consistently supported the principle that all individuals, regardless of religion, ethnic origin, economic status, or place of residence, should have an opportunity to obtain as much education as their abilities will permit and that such education should be of uniformly high quality. Changes in our society require that every person, with the capacity to do so, be educated at least through the secondary school level, and well beyond that level for a majority. Universal elementary and secondary education is imperative both in terms of the needs of society and the best interests and personal satisfaction of individuals. However, at this point, equal educational opportunity is an expression of faith rather than of accomplishment. Our Nation has made immense progress, but we still fall distressingly short of the goal. Even though over 90 percent of our children between the ages of 6 and 18 are now enrolled in elementary or secondary schools, wide discrepancies exist in the scope and quality of education provided them. Some of these institutions are overcrowded, some have inadequate faculties, some provide a minimal curriculum, and some have deplorable facilities and equipment.

Particularly distressing are inequalities among neighborhoods in large cities, many rural and urban communities, and opportunities provided for children of minority racial groups and Caucasian children in some States. All too common in our large cities, the children who need good education most—those from low socioeconomic homes—are forced to attend the least adequate schools. Even though the shockingly high dropout rates in these schools have been well publicized, little improvement has been made over a decade. Eventually, such Federal programs as the Economic Opportunity Act should help in alleviating such basic problems as poor housing, public health hazards, and inadequate recreational facilities. However, the basic educational problem lies in poor schools, and fundamental needs are for better teachers, better compensatory programs, better buildings and equipment, and better curriculums. These all call for greater financial resources, yet local property values, the prime source of local school funds, are deteriorating. Thus, the only hope for achieving equal educational opportunities in our large cities is through substantial increases in State and Federal aid.

Because many rural schools have meager financial resources and enrollments too small to permit a good learning environment, thousands of youths in these communities are also being deprived of a good education. That graduates of small high schools do about as well, on the average, in college as graduates of large high schools is misleading. A smaller percentage of graduates from small high schools go to college, yet the curriculum in these schools is limited largely to college preparatory subjects. Therefore, the 65 percent who do not go to college have little opportunity to explore their special interests and talents. Even those who are college bound have few opportunities to take enrichment courses in such areas as fine arts, languages, speech, advanced mathematics, and social sciences. Moreover, compensatory classes for the handicapped are rarely available in smaller communities. Further enlargement of school districts and more adequate State and Federal support for reorganized rural schools are imperative in solving this problem.

The story of discrimination against children from minority racial groups needs no elaboration. It is a matter of national shame, one which we are moving to correct as rapidly as possible. The claim by Southern whites that equal but separate facilities are provided for Negro youth is pure fiction. The only answer that we can live with is integration with more than deliberate speed.

The problem of inequalities in education is not limited only to elementary and secondary schools. Many capable youth are unable to continue formal education beyond high school because of prohibitive costs, a lack of facilities in many geographic areas, or inadequate space. The matter of overcrowding becomes more serious each year on many campuses, and the students' loss of identity more pressing as colleges are compelled to use mass methods of instruction.

If we are to maintain any semblance of equal opportunity for qualified youth in higher education, it is essential that we provide additional area technical and vocational schools, large scale expansion of our community college system, more substantial State, Federal, and foundation support, and continued increases in scholarship and loan funds. Positive steps must also be taken on a nationwide basis to meet the critical shortage of college teachers.

2. *Effecting voluntary completion of secondary school.* Closely related to the concept of equality of opportunity is the expectation that all young people (other than those with extreme mental disabilities) complete some type of secondary school program on a voluntary basis. Although the matter of voluntary or compulsory attendance through high school is in dispute, the *desirability* that high school be completed is not.

Completion of high school becomes more necessary as a minimal educational level for all citizens in view of the requirements for intelligent and responsible participation in the affairs of government, an adaptability in an increasingly mobile population, strengthening the family unit, and wise use of leisure time. For the majority, secondary education should be preparatory to further formal education.

But the case for completing high school is not based primarily on societal needs, but rather on the needs of the individual in a progressively more complex society. A well-balanced secondary education is a basic minimum for each citizen if he is to enjoy satisfaction as an informed, rational, and culturally literate person in his social relationships. It is not only essential as a foundation for continued education, either formal or informal, but also in order for him to be competitive in the world of work and competent in economic affairs.

The statistics on dropouts may be familiar but they are not reassuring. Nationwide, over 35 percent of our youth who enter elementary school do not graduate from high school. And in some States and local communities, the figure is well over 50 percent.

The dropout problem raises the issue of whether completion of high school should be compulsory or voluntary. A few States have raised the limits of their compulsory attendance laws to age 18 or high school graduation. However, it is one thing to provide equal opportunities for all youth, and another to persuade them to take advantage of those opportunities. We believe that completion of high school should be a choice made by the individual. That a majority of the American people hold this view is supported by the fact that in 31 States the compulsory attendance age ranges from 14 to 16, and 8 States have no compulsory attendance laws. Adolescents cannot be compelled to learn. But they can be motivated to learn if they are free to learn, and we believe the best answer is to persuade youth to remain in school through improved secondary school facilities and community action.

Our traditional commitments to the comprehensive high school may well need to be reexamined. Many high schools are not really comprehensive because they are too small or their programs are too narrow. Certainly, most secondary schools must make better provisions for differences in aspirations and talents if they are to hold a majority of students through graduation. And for some youth, special area residential schools as a part of a State system may provide the most appropriate answer. The familiar objection to specialized schools—that youth are deprived of opportunities to learn to adjust to and get along with peers from all stations of life—is not valid for large special schools with socially heterogeneous populations.

3. *Providing for differences in capacities.* As the general public becomes increasingly aware of the wide ranges in capacities among youth, it also is more desirous that our educational establishment make better provisions for them. Lay support has increased each year for guidance services, ability grouping, nongraded programs, honors courses, multitrack curriculums, special classes for the handicapped, clinical classes, compensatory education, and adult continuing education.

These essential services need to be extended if we are to keep faith with our commitment to individual opportunity. Not only does this principle imply equal opportunities for all regardless of race, creed, or economic situation, but also regardless of capacities or handicaps.

Educators have been increasing their considerable knowledge gained in working with students of varied capacities through experience and experimental programs. However, as in other areas of education, the big obstacle has been finances—for training teachers, and for providing special facilities, suitable materials, and necessary equipment. Handicapped children cannot be taught effectively in abandoned buildings and with discarded equipment and materials. Nor can they be taught by just any teacher who happens to be motivated by a desire for social service.

The same conditions apply in compensatory education. If we are sincere in our commitment to this type of educational service—and we must be—skilled teachers, school psychologists, school social workers, competent guidance personnel, and health clinicians are essential. At the same time, the need for compensatory education is not limited to children. Many adults also both desire and need opportunities to upgrade their educational background and correct deficiencies in their basic training.

An adult who cannot read or write is virtually unemployable in today's labor market, cut off from many satisfying and broadening social and cultural experiences. Nor can he participate intelligently and responsibly in political processes. The thousands of adults who dropped out of school, as well as many aliens, who now recognize their need for more education, are met with limited facilities or adult programs directed to a different clientele. This group of adults could, however, be served if schools, industry, labor organizations, government, and other educational agencies coordinated their resources to meet this critical need. At the same time, regulatory bodies in education must also assist rather than block efforts to earn needed credits and diplomas. This does not imply, however, that any proposal submitted should be approved—regulatory bodies have an obligation to protect these people against fraud, but they also have a responsibility to become more flexible.

4. *Providing and strengthening general education.* Free public schools were founded in the United States and compulsory attendance laws adopted to insure that a large majority of citizens would be prepared to participate responsibly in the processes of government. But as our Nation has grown and our culture, economy, and government have become more complex, the importance and scope of general education have increased enormously. The need for popular education to preserve popular government is but one aspect of the problem.

Recognition of the increasing significance of a broad and well-balanced general education is evident in all types of institutions and agencies. There may be sharp dissent over the nature and the structure of general education, but there is little argument that it is not important to meet the need for a responsible, adaptable, civic-minded, culturally aware, articulate, and informed citizenry. Not only have elementary schools, secondary schools, and colleges gradually expanded and strengthened their programs, but professional and technical schools are devoting larger blocks of their curriculums to general education. In addition, the rapidly growing educational programs conducted by private business and industry and labor are becoming oriented more toward general education.

There is abundant evidence to support the argument that our changing culture demands increasing attention to general education at all levels of formal education and in all types of supplemental programs. This conclusion, framed both in terms of the demands on individuals and the needs of society, carries implications for curricular changes throughout our educational structure.

A primary assumption is that general education is not limited to a common body of knowledge; there are many routes to a sound general education. The central purpose is derived from the ancient Greek commitment to the harmonious education of citizens. But since individuals vary widely in their capacities and backgrounds for learning, general education must be directed to common goals of behavior, not uniform achievements. Basic are the development of rational powers, responsible ethical values, and broad cultural interests. Specific characteristics such as basic competency, good health, civic responsibility, and economic literacy play a supporting role, but these are not primary goals. Individuals learn to think, appreciate, discipline themselves, and act responsibly toward their fellow man through many media and a variety of experiences.

This view of general education suggests elementary and secondary programs less prescriptive than at present, with more liberal time allocations and more flexible programing. Greater individualization of instruction is also indicated, with more concern for what happens to pupils and less for their acquisition of unrelated bits of knowledge required by many schools. Basic skills are no less important, but instruction should be adapted to individual capacities. Along with this, a progressively greater degree of flexibility in subjects pursued should be introduced; for example, some elementary pupils would take foreign languages and others remedial instruction in the English language arts.

At the secondary school level particularly, there would be considerable expansion of the time devoted to general subjects, greater individualization, more flexible scheduling, and more emphasis on independent study. For most secondary school pupils, vocational training, in the sense of developing entrance skills for a job, should be deferred to the post-high school years. Vocational education should become increasingly informative, exploratory, and guidance oriented in the high school. Possibly some on-the-job training may be desirable for pupils with extremely limited academic ability to motivate them to remain in school; but at most, this would involve a very small percentage of any student body.

In colleges, more liberal time allotments for general subjects, greater breadth in individual programs, and a corresponding decrease in specialization appear to be in the making. Anticipated is an expansion of small interdisciplinary seminars concerned with the unity of knowledge and occupied more with the critical issue of our times than with the systematic study and analysis of past cultures.

5. *Serving specialized needs.* Specialized programs have been an established part of the American high school curriculum since the last quarter of the 19th century. Specialization in the form of major fields of study and professional education is also a long established fixture in American colleges. President Charles Eliot of Harvard was one of the most influential early champions of elective courses, and his famous Committee of Ten report in 1892 established the model for specialized curriculums in secondary schools.

Between the early 1890's and 1950, specialized vocational offerings were greatly expanded in public high schools. This growth was encouraged to a large extent by Federal appropriations for agriculture, home economics, and vocational trades and industrial courses. Approval by the American public of such expansion is evident from their support of Federal legislation and willingness to match Federal funds from State and local taxes.

Preparation for college has been an accepted function of secondary schools since the first Latin school was established in Boston in 1635. Actually, the old Latin-grammar schools were exclusively college preparatory institutions for more than a century.

Although there is little disposition at the present time for laymen to question the place of some specialized offerings in secondary schools, in recent years the volume of questions about the nature and emphasis of specialized programs has increased. Public sentiment is moving in the direction of expanding programs of general education and cutting back on offerings and time allotments for specialized vocational education; for example, the percentages of students enrolled in vocational courses in all fields except home economics have been declining for more than 15 years, while they have been increasing in all general subject fields. And even home economics is becoming more general.

In contrast, the college preparatory function of the high school seems more firmly established now than at any time since the depression of the 1930's. However, the distinction between general and college preparatory education is becoming less defined, and in practice, there is little difference, except for student purposes, in the first years of many secondary schools.

In the meantime, public support is building up for postponement of special vocational training to the post-high school years. Congress has appropriated funds for area technical and vocational schools, and most States, supplementing these moves, are in various stages of establishing them.

Another major development in vocational education is the growing disposition of private business and industry both to contribute to the support of vocational and technical programs in community colleges and area schools and to establish their own training programs. We believe that this is a sound development and should become the norm for much vocational and technical education in areas with large complexes of business and industry. In areas farther removed, tax supported institutions seem to be necessary to meet the needs of older youth and retrain displaced workers.

Although there are many points of difference in the organization and control of some of the newer federally supported programs, public sentiment seems to support area schools for out-of-school youth and high school graduates. The pattern of joint support and responsibility by private enterprise and public institutes is also congruous with emerging manpower needs and concurrent social changes.

6. *Maintaining freedom of inquiry.* Freedom of speech and the press are guaranteed in the Bill of Rights of our Federal Constitution because the colonists had learned through long and painful experience that a free society cannot exist without these rights. But the Constitution did not mention freedom of inquiry in the schools, along with all other provisions for education. This may have been accidental or again it may have been deliberate, reflecting the decentralized structure of education at the time. Most of the responsibility for education at that time was assumed by churches, private individuals, and private corporations.

The omission of this guarantee to students to learn and to teachers to teach in a climate of freedom has become a matter of grave concern in American education. Despite a strong commitment to individual opportunity and personal liberty, the American public has been vacillating and erratic in its stand on academic freedom. Although colleges have enjoyed a larger measure of freedom than elementary and secondary schools, even in these institutions pressure groups and politicians repeatedly have challenged the right of free inquiry and attempted to restrict free study and discussion of controversial questions.

Encouraging, however, is the growing evidence of public support of the schools as agencies that must be free to deal with ideas no matter how controversial, and present knowledge and conceptualizations supported by evidence and/or logic. As the educational level of the general population has risen, citizens have displayed greater insight into the significance of academic freedom and growing impatience with self-appointed censors and bigots who attack this right. There is progressively wider public recognition that freedom of inquiry is a crucial condition for the growth of rational powers and creativity in individuals.

There also is growing acknowledgement that the vitality of a free society depends in great measure on the free pursuit of ideas, whether in the press or in the classroom. Students are becoming more restive and impatient with attempts to restrict their right to learn and to experiment with ideas. The efforts by representatives of public and private groups, including some educators, to use the schools for propaganda purposes are constant threats to the freedom of students to learn and of teachers to teach. Admittedly, the line between education and indoctrination is razor thin, and extended exploration of all the arguments, definitions, and assumptions involved in that issue are not permitted here. However, the gulf between education and propaganda is as great as that between democracy and totalitarianism. If education is to continue to function as a strong force for personal liberty as well as for social enlightenment and political responsibility, it must be protected from efforts by any groups to use the schools for propaganda purposes. Nor can faculties and school boards be permitted to exploit their positions to propagandize students. Schools as well as colleges must be kept free to present ideas, including both democracy and communism, which must stand the test of rigid examination and comparison.

At the same time, academic freedom for teachers carries with it a high sense of reponsibility—to be informed, to be able to judge the maturity of students, and to deal objectively with controversial issues in the classroom. With these guarantees from teachers, it is a moral duty of individuals and bodies in positions of authority to protect and support the right of the public schools to engage in free inquiry—whether in Toadsuck Ferry Elementary School or a great State university.

7. *Serving societal needs.* There can be no dispute over the question of whether education *should* serve the needs of society. As a vital part of the organic whole, education *cannot avoid* serving society. The dispute is over *how* and to *what degree* education should focus attention and direct its energies toward helping to solve particular social problems.

The answer to the question of *how* education can best serve the needs of society hinges on what the public regards as the primary goal of education. Our position is that the guiding concept of education for the American people is individual opportunity, and that education should be directed primarily to assisting individuals to cultivate their talents. The strength of the Nation, in whatever area—be it defense, manpower, social relations, or government—is dependent upon our success in providing ample and excellent opportunities for individuals to become truly educated.

Society's special needs in such categories as employment, world affairs, intergroup relations, national defense, public health and safety, housing, crime and delinquency, and conservation can best be met in a free society not by propaganda, but by an educated people who have free choice and who possess social wisdom and a strong sense of social responsibility. In a democracy, if we keep faith with our commitment to individual freedom, schools will serve group needs through emphasis on individual development. Education in a democracy begins with a basic program for all children in the primary grades and gradually increases in degree of flexibility and freedom of choice as the student advances. This is a matter of method as well as goals—it involves structuring learning for the most effective results. But even in the basic program, provisions must be made for individual differences.

There is no contradiction between principle and practice in providing that the learning of children be planned and directed by adults. Dedication to individual opportunity does not suggest a smorgasbord curriculum, but rather that students, as they become more mature and develop a greater sense of social wisdom, will accept increasing responsibility for directing their own learning. If the end product of this process is an informed, rational, and responsible citizenry, societal needs will be met. Through direct action or the selection of able leaders, an educated people will find answers to public needs.

At the same time, education focusing on individual growth is not insular, and many subjects and types of experiences may serve as media for developing the potentials of individual students. Again, there is no compromise with principle in selecting materials for study which deal with local, national, and world affairs. The study of past cultures is significant if the materials are germane to contemporary society. However, if schools construct their basic curriculum primarily around societal needs, there is danger that other significant aspects of education may be neglected.

The same principle also seems to be applicable in manpower development. If industry or government is faced with a shortage of electronics technicians or quality-control experts, some types of institutions may properly be called upon to provide facilities for training workers in these fields. But individuals should be free to choose and schools free to determine—without threat of penalties—whether or not they will enter these fields. Society may have greater need for physical therapists, English teachers, or social workers, and individuals may have greater talents and interests in such fields. To coerce them or unduly influence them with subsidies to enter other fields may do them a disservice and be of no lasting benefit to society.

Exceptions under the unique circumstances created by national crises have already been commented upon. Since the end of national defense is to protect the rights and freedom of individuals through preservation of free society, schools as well as all other social institutions may properly be expected to contribute in any way they are needed. But imbalances created by an emergency should be corrected as soon as the emergency has passed.

8. *Providing continuing education.* Demands for education for adults, beyond and external to conventional day school and college programs, have been gaining momentum steadily, inspired by dramatic new developments in all aspects of our culture—growth of knowledge, population, production, employment, social relationships, the arts, and recreation.

A study in 1963 by John W. C. Johnstone estimated that 17 million part-time adult students were enrolled in some type of educational program in 1961-62, and another 9 million engaged in self-study. The 17 million adult enrollees exceeded by about 2 million the total number of day students enrolled in all secondary schools and colleges for that same year.

Some of these adult students were seeking to earn a diploma or degree, but most were not. Their motivations varied from a desire to be better informed and more broadly educated to learning a new vocation or upgrading their skills in their present occupations. Programs were conducted by public school systems, colleges, proprietary business and technical schools, churches, community associations, branches of the Federal Government including the military, labor unions, private businesses and industries, and a few individuals out on their sun porches. Most were located in continental United States, but some were operated for military forces in foreign lands. A large majority of students were in residence but some were taking correspondence and television courses.

There is, therefore, a great demand for this type of education; it is a well-established branch of education, and it is growing rapidly. No oracular powers are required to predict the need and demand will continue to grow in great volume. Individuals want and need continued education to improve themselves culturally and vocationally. Society needs it because the general educational level of the public governs the pace with which we can absorb new knowledge, adjust to new developments in science and technology, and solve concomitant cultural problems. While vocational education is, and probably will continue to be, the largest single segment of continuing education, interest in education for cultural purposes, constructive use of leisure, and cognition in public affairs is growing at a faster pace.

As in all other areas of education, the pervasive and pressing problem in continuing education is financial support. Closely related are problems of teacher supply, facilities, effect on day school programs, and providing equal opportunities. Collateral problems have to do with coordinating resources, maintaining quality, obtaining credit, and such administrative procedures as scheduling and recordkeeping.

The largest single source of revenue for all types of continuing programs has been tuition and fees, but for public school systems it has been local taxes, followed by fees, State aid, and Federal aid. However, many public school programs are extremely limited in scope, as reflected by a median annual expenditure of about $1,300 per school. If opportunity is to catch up with demand, much more liberal amounts must be made available; costs to students must be reduced to keep faith with our concept of equal opportunity; and better facilities must be provided to maintain quality. Increased Federal allotments in combination with private and foundation grants is the most hopeful solution for programs conducted by public schools and colleges. However, private business and industry also have a big stake and responsibility in this area—especially for vocational training.

Inadequate teacher supply is a persistent problem, especially for public schools and colleges. Moonlighting by day school teachers is the prevailing practice, but this reduces their efficiency in both their regular and extra assignments. In addition, many day-school teachers are not well qualified for adult instruction. Enlistment of knowledgeable laymen together with some inservice training is being used with considerable success in some public schools and colleges, a practice which appears to be the only immediate answer in light of the acute teacher shortage now plaguing these institutions. In the long run, expanded teacher education and recruitment are essential.

Much needless and costly duplication of effort and even competition for students exists between

Federal and community programs and among public, philanthropic, civic, and other agencies. Therefore, coordination of efforts and resources is needed in many localities, with a local coordinating council a logical first step in reducing waste in costs and resources.

Credit and scheduling do not loom large except in the use of physical facilities. Continuing education programs should not conflict with normal day school activities, nor should the entire cost of upkeep and replacement for building and equipment be charged against the day school budget. The responsibility for expediting procedures for granting credit and necessary certificates and diplomas must be assumed by State departments and accrediting agencies.

9. *Generating knowledge.* Man's appetite for new knowledge increases in direct ratio with the volume of invention in science and the arts. While no one really knows how rapidly this knowledge is growing, the guesses of some famous scientists that it is now doubling every 10 to 15 years are plausible, if not probable. In any case, the demands on productive sources of knowledge have become overwhelming.

The effect is cumulative, with success breeding new problems and new demands. Invention in science and technology creates new problems for human institutions, which impose new demands on science and technology. Even though the burden is spread over many sources—government, private enterprise, and educational institutions—the growing demands on colleges and universities add new dilemmas to the old.

The generation of knowledge is a historic interest and function of colleges and universities. As an expression of confidence, the man on the street, while a little wary of intellectuals, has long turned to higher institutions for new knowledge and has demonstrated increased willingness to support their efforts in research and writing. But the growing confidence of the public in the competence and integrity of higher institutions, combined with a prodigious push for new knowledge, puts new strains on the resources of these institutions.

Most confounding and pressing is the matter of determining the relative efforts that should be made in teaching and research. The mounting demands on staff for generating knowledge coincide with unprecedented increases in enrollments. Yet there is a severe lag in the supply of college teachers, and many institutions are in the position of having to make an unholy choice. If top scholars on the faculty are required to devote an increasing portion of their time and energies to research and writing, obviously instructional programs are weakened. Conversely, if teaching is given priority, an institution is placed in the unfortunate position of appearing to be indifferent to societal needs and finds itself at a disadvantage in securing research grants from foundations and government. The choice and interest of individual scholars further complicate the situation. Many resist the opportunities for greater financial rewards in government and private research because of the satisfactions they derive from university associations. However, if university conditions become unduly restrictive, and an institution is inflexible in making assignments, it cannot hold top personnel as other areas become more attractive.

While there are no neat answers to these problems, it seems that in the long run society stands to gain more through support of teaching than it does by increasing its demands on university staffs to meet immediate problems in research. The supply of young scholars to meet future needs is dependent on the quality of current instruction in all our schools and colleges, and many perceptive university administrators, along with a number of distinguished commissions, have warned that greater national effort must be made to increase the supply of competent teachers, both in the lower schools and in the colleges. Unless priority is given to the preparation of more and better qualified teachers, both teaching and the generation of knowledge will suffer in our educational institutions.

Additional dimensions of the problem created by accelerating research demands on higher institutions have to do with balance among disciplines and the coordination of efforts among institutions. Governmental support of science and technology while neglecting humanities, social sciences, and the arts has resulted in severe disparities which have brought about damaging imbalances in our culture. Although recent legislation reflects some sensitiveness to the problem, persisting inequalities point up the urgency for coordinated and long-range planning at the national level.

Of equal concern are the inequalities in support and lack of coordination of efforts among higher institutions. Inadequacies of present machinery for coordinating policy as well as the urgency of some of our research needs have resulted in severe gaps and overlaps in our national effort.

III. ENDS OF EDUCATION

The word functions has been used to refer to the operational things expected of institutions to educate individuals; ends is used to designate the qualities or competencies that educational institutions undertake to develop in students. The following is presented simply to serve as a somewhat sharper backdrop against which educational policies and plans can be considered. For example, the outlook for the future in a world of automation and technology points to an acceleration of the movement of population from rural to urban areas along with a sizable increase in the amount of leisure time available to the average worker. Without adequate recreational facilities and a creative approach to the constructive use of leisure time, the tensions and conflicts of urban living may well become one of our most corrosive social problems by 1984.

If schools, colleges, and supplemental educational agencies are called upon to make education for leisure one of their deliberate aims, to what extent will this change affect other aims and the overall balance of education? Does instruction for leisure imply lesser attention to other ends? And, if so, in which areas should attention be diminished? Possibly other problems are more consequential, but the prospect for leisure time serves to illustrate the type of decisions that will have to be faced in education. Without rational consideration of the purposes of education, we try to do everything without doing anything very well.

Popular education as a base for popular government was the principal concern of the first draftsmen of educational objectives in the early years of the Republic. Proposals by Washington, Jefferson, and John Quincy Adams, while roughly hewn, displayed profound insight into the dilemmas of democratic government. The specter of mobocracy hung heavy, and education of the masses, as revealed in the writings and speeches of men of public stature, were of first import—except in the framing of the Constitution. As ends of common education, Jefferson proposed that every citizen be given information needed to transact his business, the ability to calculate and express his ideas and contracts in writing, the ability to read to improve his morals, understanding of his duties to his neighbors and country, knowledge of his rights and desire to exercise them with justice, and capacity to observe with intelligence all his social relationships.

For higher education, Jefferson specified developing statesmen, legislators, and judges for the general good; expounding the principles of government; harmonizing interests of agriculture, manufacture, and commerce; developing reasoning faculties of youth; cultivating morals; perceiving virtue and order; enlightening youth with mathematics and physical science; advancing the arts; administering health; and securing the comforts of life.

The rhetoric of modern statements may be more timely, but Jefferson's combined proposals embrace most of the ideas found in current drafts. During the period of Jacksonian egalitarianism, educational objectives reflected less concern for civic and moral outcomes and more for equality in economic and social conditions. Education as the way out of poverty and to higher social status was a popular hope.

The best known and most quoted draft of the ends of education for the common schools in this century is the "Cardinal Principles of Secondary Education" authored by the Commission on the Reorganization of Secondary Education. The Commission specified as primary aims: health, command of fundamental processes, worthy home membership, vocation, civic education, worthy use of leisure, and ethical character. These qualities and competencies are still to be desired in citizens, and add the dimensions of vocational competence and worthy use of leisure time to earlier lists.

Of the countless number of pronouncements on educational aims following the publication of the "Cardinal Principles," almost all include the original seven objectives with an occasional addition, such as knowledge of science, appreciation of beauty, and democratic social relationships. In 1938, the members of the Educational Policies Commission made a valuable contribution by classifying the many specific objectives included in numerous State and local reports under the following four broad categories: (1) Self-realization, (2) human relationship, (3) economic efficiency, and (4) civic responsibility. Most statements from 1915 to 1950 reflect the influence of the concept of social efficiency that gained a wide following among educators and laymen during that period.

Recent statements have added the dimension of common developmental needs or problems of children and youth at certain stages of growing up, and include such ends as assisting children in adjusting to their peers, to physiological changes, and to standards imposed by adult society. And the two White House Conferences on Education emphasized special problems, such as educating the handicapped and culturally deprived, challenging the gifted, reducing the dropout rate, and meeting manpower needs.

All of these statements call attention to desired goals for education, but their lack of coherence and structure are devitalizing. Admittedly, the ends of education for a preparatory academy in New England, a technical school in Los Angeles, and a rural school in South Dakota differ in important respects, but there are basic common ends for elementary and secondary education in the United States which should serve as guides for all. In practice, a majority of schools give little thought to their overall aims and have no clear statement of what they are trying to do. Consequently, they have little basis for determining how well they are doing except for performance on some standardized achievement tests which measure only one type of outcome. And these results are likely to be misleading unless interpreted in terms of the capacities and cultural backgrounds of their students.

We see no ready answer to the lack of unifying goals on a nationwide basis or to the inattention to goals at the local level. However, a national committee composed of eminent educators and laymen could make a valuable contribution by formulating a model statement of functions and ends which would have sufficient merit to command respect and influence State and local programs. A relatively small committee working intensively over an extended period of time could make greater headway than a large conference in session for a few days. All important would be the process of dissemination. The model should be widely studied, debated, and modified by local faculties and patrons.

A scholarly model could do much to call attention to common goals and provide a pattern for local schools in developing statements. It would be especially helpful in directing attention to essential components in a unified model. For example, the following broad categories of ends are fundamental in a program of elementary and secondary education—public or nonpublic:

1. *Personal well-being and competence*, involving such ends as health, rational powers, competence in communicative and computational skills, intellectual interests, personal ethical values, self-concept, good work habits, cultural interests, and recreational interests.

2. *Social responsibility and adjustment*, including knowledge of social problems, empathy with and understanding of others, commitment to the dignity and worth of man, ability to cooperate with others, and a sense of responsibility in community and family relations.

3. *Commitment to world peace and understanding*, such as knowledge of other peoples and their cultures, keeping informed on causes of world tensions, understanding of political and economic conditions in the world family of nations, reasoned support of our Government's policies in world affairs, willingness to serve in efforts to maintain world peace and the well-being of all peoples.

4. *Youth needs and problems*, including understanding their own physiological makeup and growth, wholesome peer group relations, planning for future education and work, moving to independence, understanding problems of adjustment to healthy adult heterosexual relationships, and preparing for marriage and family responsibilities.

5. *Economic competence*, such as knowledge of the nature of economics and our economic structure, economic relations with other nations, knowledge in managing personal economic affairs, sense of economic responsibility in production and consumption, and appreciation of responsibility in civic economic affairs.

6. *Civic responsibility*, involving such outcomes as knowledge of history and structure of governments, understanding political structures and the role of political organizations, interests and responsibility in political action, responsibility in community affairs, keeping informed in politics and government, and respect for law and orderly processes.

Chapter 3. Adult Education and the Learning Society

I. INTRODUCTION

Within each of these categories provision should be made for cognitive and affective outcomes and skills.

Institutions other than elementary and secondary schools may extend these in their general programs, and clearly should supplement them in terms of their special functions. Our intent has been to call attention to a need rather than to attempt to draft a definitive model.

Lifelong education has become an urgent necessity for both the individual and the Nation. It is an indispensable requirement for survival in a period of rapid change and, given full expression, it holds, more than any other factor, enormous promise for the material and spiritual enrichment of our country.

The crisis of our age is to a great extent a crisis in the education of adults. It is created because adults, when confronted with personal, political, economic, and social problems, are compelled to reach decisions without the knowledge necessary to make them effective and relevant. This uneducated judgment threatens the well-being of both the individual and society.

The continuation of the relative position of the U.S.A. among the nations of the world depends on the quality of its population, which, in turn, depends on the effectiveness of its education. As good as present programs of schooling for children and youth are, they fall far short of bringing the talents of the total population to their full capacity. Nothing short of education throughout the entire lifespan is sufficient to produce the excellence of life which the U.S.A. must achieve to maintain its leadership in the years ahead.

II. THE CHANGING ADULT AND THE CHANGING SOCIETY

There are two major and compelling reasons for the importance of the continuing education of adults. One is the changing individual himself, and the other is the changing society in which the individual lives.

It is easy to be misled by charts portraying the rate and direction of child growth and development. They rise rapidly in the early years, and they flatten out as they approach the period of maturity. From this, we have often drawn the erroneous implication that the adult years represent a plateau of changelessness or decline. But this is not supported by the facts. In no facet of their performance and responsibilities are persons the same at 30 as they are at 20, the same at 40 as at 30, and so on. To be 25, single, and still looking for an economic foothold is one state of affairs; to be 30, married, and starting on the job is another; to be 40, with children of varying ages, and striving to keep abreast if not ahead of the job is yet another thing; and to be 65, experiencing decline of physical powers and facing unknown years of retirement is yet another. The idea that one grows up in childhood to settle down in maturity, with no need or capacity to learn, is a naive and distorted interpretation of the successive demands which the adult confronts as he moves through the full span of life.

The other point underscoring the necessity for adult education is that we live in a period of unprecedented social and economic change. At no time in history has the rate of change been so great, and at no time has the acquisition of knowledge and skills been so important in order to comprehend the change and keep its consequences within manageable limits. To select some random examples, there is no reference to the U.S.S.R. in any standard encyclopedia printed before 1917, and no facts about Pakistan in any document published before 1948. Commercial television was foreshadowed for the first time in 1939; nuclear fission was first produced at the University of Chicago in 1942.

Sputnik first orbited in 1957, and in only the last 5 years has commercial jet travel become common.

Or consider the history of technology. It took man roughly 500,000 years to arrive at the agricultural revolution, when he began to plant and cultivate crops. It required another 25,000 years to usher in the industrial revolution, another 200 years to reach the atomic age, and only 15 years to launch the space age. Ninety percent of all the scientists in the history of the world are alive today. Eighty percent of modern medical practices was discovered in the last 20 years. It is estimated that knowledge is now accumulating at such a rapid rate that it will double in the next 15 years.

Gordon Brown of M.I.T.'s School of Engineering said that "an engineer taking his undergraduate degree in the years prior to 1950 would have had at best only a slight brush with nuclear physics and engineering, feedback control and inertial guidance, information theory, computer technology and its applications, solid-state physics and half a dozen other subject areas which have joined older subject matters or displaced them in importance. Yet a high proportion of our practicing engineers date from that pre-1950 period."

A. C. Monteith, an official of Westinghouse Corp., has graphically described the consequence of such rapid growth of new knowledge by saying that a graduate engineer now has a half-life of about 10 years; that is, "about half of what he has learned will be obsolete in a decade . . . about half of what the engineer will need to know 10 years from now is not available to him today . . . ."

"Thus," he continues, "for the first time in the history of civilization, the time of drastic cultural change has been telescoped into less than the lifetime of the individual. The current generation of mature adults now represents the first generation faced with managing a culture different in *kind* than the one originally transmitted to them. The consequences of this new fact of life are such that the well-educated youth of today is an obsolete man tomorrow. The implication of this sudden turn in the tide of civilization is clear; a society that makes its educational investment almost entirely in children and youth is on the way to becoming obsolete and is reducing its chance for survival."

The response to this new fact of modern life is already becoming impressive. According to the National Opinion Research Center's recent survey of participation in adult education, about "25 million out of 114 million or about 22 percent of the adult population, took part in some adult educational activity during the year 1961–62. Forty-seven percent had taken one or more courses since leaving school, 38 percent tried to teach themselves something. Sixty-one percent had engaged in one or another of these learning experiences in the past."

At the same time, 44 percent had indicated an interest in learning more and a disposition to do something about it; i.e., were interested and ready, while an additional 26 percent indicated an interest but would not admit to being "ready."

The idea, then, that education is only for youngsters in college or graduate school is as obsolete as the horse and buggy. The inescapable lesson of our times is that learning is becoming increasingly a way of life for the entire population, for both sexes, all social classes, and all ages. Lifelong education is, in short, becoming a universal necessity because we are living in a learning society.

III. THE RELATION OF THE CONTINUING EDUCATION OF ADULTS TO THE FORMAL EDUCATION OF CHILDREN AND YOUTH

The growing demand for truly universal lifelong education has as great implications for the formal education of children and youth as it does for the continuing education of adults. In the learning society, elementary, secondary, and higher schooling would *primarily* be *preparatory* for lifelong learning. The new "prep" school concept will not be that of the old secondary school as preparation for college, but rather the entire kindergarten to postgraduate apparatus would act as the "prep" school for the learning which will increasingly be required in adult years. Every teacher of youth will, in an anticipatory sense, be a teacher of adults. An unqualified, wholesale application of this point of view will ultimately produce basic changes in the entire outlook and practice of the formal instruction of children and youth.

What might some of these changes be? Above all, the new education would generate a growing and pervasive sense of a learning future. Both the teacher and the pupil would necessarily be required to take the "long look" concerning the consequences of any learning, and at no time would learning be regarded as terminal. Teaching would always have an open-ended quality, promising exciting new subjects yet to be explored beyond any unit of instruction. The student's career as a potential learner would never stop—it could be interrupted, or intermittent, but never regarded as final. The impossible notion would be scrapped that in 12, 14, or 16 years enough knowledge can be acquired to last a lifetime. The high school and college diploma implying the completion of studies would give way to a "certificate of transfer" from earlier to later learning, and the ultimate test of formal schooling for youth would be the extent to which it contributes to the continuing education of adults. Thus, all the apparatus of admissions, achievement testing, marks, promotion, graduation, etc., would be reconceived in favor of procedures designed to sustain the individual in an ongoing lifespan process of educative self-renewal and development.

What guidelines can be suggested for putting this approach to work? First, "learning to learn" could be made a central objective of teaching. To borrow from some of Bruner's recent writing, the structure of subject matter would be made explicit and thus how things are related would be learned.

Bruner's concept of the "spiral curriculum" suggests how this could relate childhood to adult learning. He says, "The basic ideas that lie at the heart of science and mathematics and the basic themes that give form to life and literature are as simple as they are powerful." Thus, these elements could be introduced into the curriculum much earlier than they are now, and, turning spirally back on themselves, be used as takeoff points for transferring their application both to higher levels of complexity and to later stages in the lifespan. In this manner, by introducing essential themes early for reuse in later contexts, we would be more likely to encourage transfer from youth to adult learning.

Emphasis on "learning to learn" would also make more explicit the "why" of method, an example of which may be noted in the "whole-part" sequence of covering a unit of subject matter. One would begin with a preliminary view of the whole, continue with a more detailed study of its parts, and conclude with a recapitulative view of the whole. Beginning with the Gestalt theory that the "whole is more than the sum of the parts," and following through with the proposition that the parts derive their meaning from the whole, the parts should, as far as possible, be studied in the context of their whole. This explains the use of the pre- and post-overview as a means of providing context for subdivisions of subject matter. It also illustrates a way by which the pupil may become explicitly aware of the "why" behind other methods and thus may greatly expand his range of transfer.

Another means for increasing the transfer from youth to adult learning would involve augmenting the linkages between the elementary, secondary schools, and colleges on the one hand, and the educational programs for adults in the community on the other. In this way an environment would be provided where the pupil would be imbued with an appreciation of the relation between what he has started in school and the programs to which he can turn for continuing these inquiries in later years. He would be constantly reminded by the administration, guidance personnel, and his teachers that in the adult program (usually night school) of his own school system, in correspondence study, university extension, the military service, business, industry, churches, labor unions, libraries, museums, educational television, etc., lies an attractive array of facilities for the renewal of a former skill or the cultivation of a deferred or late-blooming interest.

The initiative for creating the linkage mechanism would be the responsibility of the school. Its formation would increase the relevance of regular formal instruction, and also enhance the possibility of transferring youth to adult learning by producing expectations with a built-in facility for fulfillment. The imperative demands of a learning society would therefore compel a much more thorough articulation of the formal schooling of children and youth with the agencies of adult education. In fact, in many instances youth could, with great mutual profit to both themselves and adults, be encouraged to attend adult classes. In many communities, strong programs of adult education designed as a common learning enterprise for youth and adults have been highly successful. In a learning society there should be nothing sacred about age-grade educational segregation.

Pupil personnel and accounting, or more specifically, grading and promotions has already been suggested as a sector of the educational enterprise which would be drastically overhauled if the imperative of lifelong learning is to be seriously implemented.

Explicitly, if a learning society increasingly requires all its members to keep on learning throughout their full lifespan, the school, which is the servant of that society, must be unqualifiedly committed to giving the optimum opportunity and encouragement to continue learning, not just to the verbally competent and college bound, but to everyone. This would compel us to take more seriously than we have ever done the problem of individual differences, and involves a different kind of marking scheme—one that is diagnostic and not hierarchical. Ungraded schools would be expanded and promotions eliminated. It also means that while one student cannot be expected to succeed equally as well as the next, or even at everything, he should not be permitted to fail at everything he attempts to learn. Above all his self-image and confidence as both a learner and a potential learner should be protected and encouraged at all costs. For if he is to be a lifelong learner, the school must give him the necessary confidence and skills and not cut him down before he begins the competitive struggle of living.

IV. SOME UNFINISHED BUSINESS OF ADULT EDUCATION

The emphasis on the importance of the education of adults for the instruction of children and youth should be matched with an equal emphasis on the unfinished business of adult education in its own domain.

The Functionally Illiterate

It is shocking to learn that in the United States almost twice as many persons over 25 years of age have had only 4 years of education or less than the number of our college graduates, and over 2 million persons aged 25 and over have had no years of schooling at all.

The lack of basic education among these millions of citizens, both native and foreign born, constitutes a national problem of great magnitude and urgency. It increases the amount of ill health and poverty, retards economic development, reduces the manpower available for military services, lessens efficiency, and impedes the personal growth and social contribution of citizens in a democracy. The military deficit has been documented: During Korean hostilities 300,000 men were rejected because of educational deprivation. In this respect the United States is as underdeveloped as many other nations of the world.

The Technologically Displaced Worker

Data concerning the displacement of workers by automation and other forms of an advancing technology are seriously inadequate. Moreover, evidence about what happens to workers after they are displaced is even more fragmentary. It is impossible to discuss this problem with statistical assurance. However, there is abundant evidence that for unknown thousands new techniques are making old skills obsolescent, and new skills mandatory. Many workers show great resourcefulness in improving their own performance or in moving to new jobs. But great numbers of the displaced are forced to turn to work far below their level of competence or are cast aside from the mainstream of productive effort.

The problem is too vast and complicated for a definitive treatment here. It is sufficient, however, to indicate that here is a major part of the unfinished business of adult education, one which will require an enormous effort in order to keep the problem within manageable bounds.

Education for Aging

Since 1900 the lifespan in the United States has increased more than 22 years. In 1850 persons 65 years of age and over comprised 2.6 percent of the population; today they constitute approximately 12 percent and are expected to reach 15 percent by 1975. Because problems of older persons often center around difficulties of employment, financial support, health, housing, etc., it would be easy to overlook and neglect the educational dimension of their situation.

Relatively few of the traditional educational services can now be applied unqualifiedly and without major modification to the instruction of elderly adults. Therefore, a great need exists for experimentation in the development of new programs for this group. Among other things, the possibility of retraining certain retired persons to return to active service in occupations which suffer shortages of manpower could be explored. Experimentation could also be directed to developing the civic and spiritual capital of the older person in his effort to live out his years in social usefulness and individual fulfillment.

But just as important as the creation of new educational services for older persons is the development of educational programs for adults in the years of early and middle maturity for the purpose of cultivating their understanding of the nature of aging, and how the problems of aging may be met. The opinion is widely shared that education concerning aging should not be confined solely to the later years. Suitable instruction for persons in all age groups can go far in eradicating many misconceptions regarding aging which cause difficulty in later life, and help increase assets which can be applied when lives must be reoriented to the necessities of later years.

Education of Women Between the Ages of 45 and 65

A less publicized group also needful of a new pattern of education is made up of women between the ages of approximately 45 and 65, or when their child-rearing task is over or drawing to a close. While still employable they are, in fact, usually unemployed. Women in this group should look upon these decades as the most productive of their lives, which should include something more than attendance at bridge teas and cocktail parties and trips to the beer tavern and beauty parlor. Here again is a challenge to educational statesmanship to create a new program of continuing education. Some beginnings have been made, but they are designed mainly for the educated middle class; and even at that are only a drop in the bucket.

The School of the Multiple Chance

From a fourth to a half of students drop out of high school before graduation, and another fourth to a half of entering freshmen fail to finish college. Both groups deserve multiple chances not only to improve their own personal well-being, but also to increase the total human resources of the American Nation. *The necessity of adult education should be established on these grounds alone: The equalization in the adult years of an opportunity interrupted in youth.*

V. SOME OBSTACLES TO THE DEVELOPMENT OF ADULT EDUCATION

So far the need for the continuing education of adults and some of the decisive forces giving rise to this need have been discussed. It seems appropriate at this juncture to examine some of the obstacles which stand in the way of meeting the needs outlined.

The Need for Additional Personnel

Trained personnel is a big factor in the success of any enterprise. If enough well-trained persons are available to carry on and improve the core activities of an agency, progress toward its objectives is possible. If not, the program of the agency, however noble its aspirations, will languish.

That adult education gets along as well as it does, with the services of such a small number of full-time workers, is a tribute to its vitality, but not evidence of its professional stature. This shortage of personnel is universal, with the possible exception of the cooperative agricultural extension service. The best evidence of this state of affairs may be found in the predominantly part-time and overworked personnel of adult education in public schools.

A reasonably typical illustration is a State with 181 school districts, only 80 of which have 1 or more classes for adults, with only 22 persons assigned to duties in the administration of local adult education programs. Of these 22, only 5 are full-time directors of adult education.

Comparative statistics on the number of adult education workers in libraries, labor unions, churches, business organizations, farm groups, health departments, university extension, evening colleges, etc., are not available, but those acquainted with the problem generally acknowledge that the lack of personnel is so great and universal, it constitutes a serious obstacle to development of this field.

The Need For More Knowledge About Adult Education

Anyone working seriously on problems of adult education is struck with the dearth of knowledge in this area. Only recently has the U.S. Bureau of the Census been persuaded to include a question on the level of formal education of persons over 14 years of age. Although data collection in the U.S. Office of Education has improved, it still does not provide statistical material which would enable a comprehensive and accurate picture of the national situation. The situation at the State level is little better. It is not surprising, therefore, to discover that practically nothing of a systematic, comparative, and reliable character is known about the details of such matters as financial support, curriculum, administration, organization, costs, source of personnel, and outcome of school adult education. With the exception of the cooperative agricultural extension service, the small amount of knowledge possessed by other agencies about adult education is most serious.

In addition, little attention is devoted to adult education in research by economists, sociologists, political scientists, psychologists, professional educators, and other workers in related areas. The first number devoted exclusively to adult education by the *Review of Educational Research* appeared in June 1950; the second in June 1953; the third in June 1959; and the last in June 1965.

Useful as these documents are, the major impression they leave is that so important a subject of human endeavor and potential academic inquiry has been almost completely bypassed by those whose major professional preoccupation is the systematic study of education.

Similar evidence is contained in the professional literature on education. The writer of this report has supervised a study of over 100 major book-size publications in the various divisions of professional education—for example, curriculum, history, philosophy, administration, personnel, school buildings, finance, comparative education, and educational psychology—for the purpose of discovering the extent to which this academic material considers adult education along with customary concerns of elementary, secondary, and higher education. *The neglect is monumental.* The failure of the professional educator to consider lifelong education as a continuous process for which the formal instruction of the elementary, secondary schools, and colleges is, in fact, preparation, constitutes one of the most phenomenal and tragic blind spots of the pedagogical establishment.

If one adds the fact that probably no more than 12 universities in the country are devoted to advanced training and substantial inquiry in the field (and many of these recent arrivals on the scene), it is fairly simple to conclude that continuing education, regarded by such diverse authorities as Benjamin Fine, Sir Richard Livingstone, Robert Maynard Hutchins, and others as the most important segment of the educational enterprise, has failed by a wide margin to receive the thoughtful and systematic attention it deserves.

Marginality of Institutional Affiliation

One factor contributing to the lack of personnel in and knowledge about adult education is the marginal character of its institutional affiliation.

There are no institutional exclusives in adult education. As a program it is amorphous, sprawling, and diversified because of two elementary facts—first, because of the highly diverse character of adult interest, and second, because of the wide variety of public and private agencies which engage in the field.

As a corollary, adult education is the task (often unlabeled) of many agencies, and usually it is the only one (although often a major one) of several tasks in which the agency is engaged; e.g., public libraries, public schools, universities, and public health programs. Unfortunately, however, in the case of many agencies, the function of adult education receives somewhat less than major emphasis in the hierarchy of agency priorities. More specifically, the public library is first, a central storehouse of materials; second, an agency of education; and third or fourth, if at all, an agency of adult education. The community college is first, a door to upper division studies; second, a program of terminal schooling; and third or fourth, if at all, a vehicle of adult education. For its part the university is first an institution for the cultivation of the higher learning for college, postgraduate, and professional students; and somewhere down the line, if at all, it is an establishment for education of adults. Finally, the vast array of voluntary organizations (chambers of commerce, labor unions, service clubs, fraternal orders, and the like), whose programs in the aggregate contain enormous resources for the instruction of adults, center primarily on the special interests—often social and/or vocational in character—of its membership, and only secondarily on education.

The Dilemma of the Educational Squeeze

A current dilemma of education is caused by the enormous needs of adults for further education on the one hand, and the equally insistent and even more visible demands for elementary, secondary, and higher education on the other. With the status of adult education already marginal in practically every agency serving the field, it is difficult to withstand the argument that no public funds should be set aside for the education of adults when not enough funds are available to provide an adequate education for children and youth.

This is, of course, fallacious, because the addition of money for the education of adults need not subtract from money for the education of young people. Nor, even more importantly, does more education for adults mean less education for children. As a matter of fact, the evidence supports the converse: As adults become better educated, they are better educators of their own children and are also generally more willing to support the education not only of their own, but of the children of the community as well.

A fallacy to this argument can also be found on historical grounds. At no time in the history of the United States have the American people withheld support from secondary education because elementary education was not completely underwritten. Nor have they held up the expansion of higher and professional education until *all* high schools could be equipped and staffed to carry *all* their students through to graduation.

In spite of this, however, and except for recent Federal legislation, adult education faces an uphill fight today for any substantial expansion of its programs in the near future.

VI. AN AFFIRMATION OF THE PARITY OF ADULT EDUCATION

The generations-old notion that education is the equivalent of schooling has given rise to the misconception that education is something which happens to children and youth while they are in school, and has no bearing on the well-being of adults as they struggle with the problems of mature living. As Adler, preceded by the Greek philosophers, pointed out, it is much more plausible to regard the elementary and secondary school as a preparation for the education that should take place during the remaining years of life. It may be wrong and it may solve no problems to place the education of adults ahead of the education of youth, but adult education should be given a status of parity, at least in our policy and affirmations if not in practice. An emphatic acceptance of the education of adults as an equal and legitimate member of the institutional family would go far toward giving adult education the prestige it requires to achieve the stature it deserves.

VII. A PROPOSAL FOR NATIONAL, STATE, AND LOCAL COMMISSIONS ON ADULT EDUCATION

In the judgment of this writer, not enough is now known to outline a nationwide program of adult education. It is proposed, therefore, that the Federal Government, in partnership with selected foundations and other private agencies, form a national commission for the purpose of studying the field and making recommendations for the development of such a program. The national commission should be paralleled by State and local groups, working at the same problem and for the same purpose within their respective jurisdictions.

Among other things, this commission would (a) conduct an extensive program of data collection concerning the present status of the field; (b) examine the way adult education embodies the law of increasing returns; i.e., how a modest addition to existing facilities increases the support of the general program; (c) make recommendations for curriculum, development, personnel, and support of adult education; and (d) review the feasibility of setting up a quasi-public authority on adult education at local, State, and national levels, designed to combine the resources of public and private agencies in developing the field.

Chapter 4. Education as Preparation for Employment: Broadening the Base of Responsibility

I. INTRODUCTION

Organization of This Paper

In these times, it is manifestly inappropriate to speak of "educated" versus "uneducated" members of our work force. Rather, we must speak of various levels and forms of education demanded for employment and of various segments of society with educational responsibilities. For it is no more appropriate to think of education today as a responsibility of a single segment of society than to think of education as occurring at a single stage in the life of an individual. The age of compartmentalized needs, concerns, or responsibilities is past. The purpose of this paper is to present a view of education as preparation for employment which hopefully will be pertinent today.

At the outset, it is necessary to define "Education" and "supplementary educational experiences".[1] The term "Education" is used here to represent that aspect of society (a) whose major reason for existence is to provide education and/or training, including, for example, public and private schools; and (b) in which decisions of students with reference to school are at least as important as the decisions of training agencies regarding students. The term "supplementary educational experiences" is used to describe educational offerings, such as the MDTA and EOA, which are not viewed as properly meeting both of the above characteristics of Education.

Equally important, the concept of people as persons must be kept clearly in focus. In this sense, "Education" is used to describe instructional educational experiences for people who *can* and *will* seek preparation for employment. "Supplementary educational experiences" is used to describe experiences for those persons who (a) *cannot* find, (b) *determine not to* seek, or (c) *cannot and determine not to* seek employment preparation opportunities.

On the basis of these two categories of preparation for employment and four categories of persons, an attempt will be made to describe educational patterns of preparation for employment which in some form are now available.

Preliminary Thoughts Regarding Education

Education provides opportunities to prepare for employment for most persons who want to learn and have the ability to profit from instruction. Responsibilities of Education as preparation for employment begin in the elementary school and carry through to the highest level of graduate work, and range from preparation for the lowest level of semiskilled trades to the highest degree of occupational skill represented in the working world.

Underlying all Education is a commitment to the fullest development of the individual consistent with his needs, abilities, and desires. In Education, prime emphasis is placed on providing opportunities for individuals to learn if *they* want to. In a very real sense, Education is committed to giving individuals the right to fail by extending to them the chance to succeed. In Education, we find a basic assumption that societal needs can best be met indirectly through directly meeting the expressed needs of its individual members.

Our entire system of Education as preparation for employment is based on a belief that people want to take care of themselves, that they will voluntarily take advantage of educational opportunities, and that they will so highly prize Education that they will commit themselves to considerable personal sacrifice in order to attain it. There are, of course, some for whom this is not true.

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[1] This may be confusing because special meanings have been assigned these terms which are pertinent to this paper. The rationale is as follows:

(a) Characteristics and motivies of both Education and students must be considered.

(b) Usually, and for most, formal Education is effective. If Education always did what it says it tries to do *and* if all people were as Educators wish they were, there would be no need for such supplementary educational experiences as the MDTA and the EOA.

(c) When the educational needs of certain individuals are not met by formal Education, the basic causes *may* lie wholly within Education *or* the individual, but usually both are involved. It is hoped that this paper will present realistic views with respect to probable causal factors, views which are essential for formulation of sensible courses of action.

(d) The question of how to meet the educational training needs of those who resist or are resisted by formal Education is complex. A crisis orientation alone to education as preparation for work is inadequate as a long-range strategy, and immediate remedial action programs must be combined with long-range strategy for educational planning.

Similarly, education is committed to broadening the range of opportunities from which individuals can choose, and to helping them choose wisely from available alternatives. Freedom to choose, then, must always be considered a relative rather than absolute condition; i.e., nobody is without restrictions. At the same time, freedom of choice is more nearly represented as something an individual *exercises* than something he is *allowed*, and true freedom lies more within the individual than in his environment. Education is committed to the fullest development of this concept of freedom.

The Potentially Unemployed

Persons for whom supplementary educational experiences are needed fall into three categories which together describe the potentially unemployed. In the first category are those whose educational needs as preparation for employment are not met through formal Education, for several valid reasons: Vocational preparation required for a specific job may not be offered by formal Education; some individuals may be so handicapped by economic background and family responsibilities that it is not feasible for them to pursue formal, even "free", Education; or, these two instances may appear in combination. People who are affected by these circumstances do not differ from those enrolled in formal Education in terms of a desire for gainful employment or to take care of themselves. But they do not have the same opportunities to take advantage of formal Education.

Others in our society have consciously rejected the opportunities offered by formal education: More importantly, they lack the societal value which prizes the desire to be gainfully employed. Some may have rejected this value while others have never been exposed to it. In either event, special incentives must be provided to change the basic value structure of these persons if they are to become active members of the labor force.

Still others *cannot* take advantage of the opportunities which education offers nor have any visible desire to do so. These are truly "hardcore" unemployed. For them, extensive adaptations and variations from the system of formal education will be necessary if they are eventually to assume roles as productive workers.

Basic Assumptions

The concept of education, including both formal Education and supplementary educational experiences, as preparation for employment is based on certain assumptions. Some of these apply only to formal Education, and others only to supplementary educational experiences; but most apply to both. *Recognition* of these assumptions is prerequisite to acceptance of the organization of this paper. *Acceptance* of these assumptions is not.

First, it is assumed that full employment, that is, employment of all those undertaking self and/or family responsibilities for economic maintenance and survival, is a desirable goal of American society.

Second, a desire to be gainfully employed is a part of the value system which our society seeks to encourage and, when necessary, even impose on all who we feel belong in the labor market.

Third, those who accept desire for employment as a personal value will usually find this value satisfied through means of Education. That is, supplementary educational opportunities will not compete with Education.

Fourth, supplementary educational experiences include both those made necessary by employer needs and by virtue of the inability or unwillingness of certain individuals to accept desire for employment as a personal value. Both kinds of supplementary educational experiences can be viewed as special and/or remedial education for those whose needs have not been fully met by formal Education for any reason or combination of reasons.

Fifth, our societal system emphasizes maximum freedom to choose and the welfare of all who accept and seek to implement the societal value of desire for gainful employment. Conversely, societal goals sometimes take precedence over both individual freedom to choose and the welfare of the individual when this societal value cannot be accepted and/or implemented through formal Education.

Biases of This Paper

Perhaps the strongest, and certainly the most persistent, bias of the writer is a belief that individual initiative to pursue educational preparation for employment should be encouraged, and individual freedom of choice protected. This is based on a belief that for the student a strong desire to learn and personal conviction regarding the importance of that which is being taught are vital to the success of any educational enterprise. These factors are of relatively greater importance than instructor qualifications, instructional materials, or physical facilities. This bias is also based on a belief that the strength of our occupational society rests in large part on the degree of commitment of a person to his occupation. This may not necessitate interest in the occupation, but it should always involve perceptions of choice. Part of the process of becoming a person is the decision to do so. Therefore, freedom to choose and personal awareness of that freedom are requisite to accepting personal responsibility. Thus, individuals should choose their occupations and be aware of the reasons for their decision if maximal *development* and *utilization* of manpower are to be complementary.

A second strong bias of this paper is a belief in the vital importance of formal Education, which has been expressed in full recognition of the necessity for other supplementary educational opportunities. Nevertheless, Education represents that part of society which exists primarily to help people fulfill *individual* educational goals. Justification for and evaluation of formal Education is primarily based upon benefits accruing to *individuals* as a direct result of their educational experiences. This is not true for any of the supplemental educational opportunities described here, since supplemental opportunities are based on additional *primary* goals and objectives which must be considered in the organization, administration, and evaluation of educational efforts. In choices involving the welfare of the individual and that of an educational enterprise, the agency responsible for supplemental educational opportunities will not necessarily give primary consideration to the welfare of the individual.

A third bias is dissatisfaction with all current forms of Education. The need for improvement of quality of Education is emphasized more than a need for increased quantity, and numerous pleas are made for more experimentation to discover ways to change educational practices. No part of Education does not need to be improved, to be more susceptible to change, and to change more rapidly and more knowledgeably. The need to find better ways of serving students must be constantly emphasized in order for the total pattern of educational opportunities to develop toward meeting educational needs of individuals as preparation for employment.

A final bias is the belief that educational opportunities need to take individual differences into account, with the essential nature of its patterning diversity, not conformity. There is no single best way of accomplishing any educational objectives, and we hope there never will be.

II. FORMAL EDUCATION AS PREPARATION FOR EMPLOYMENT

Very few aspects of Education are or should be viewed as unidimensional in purpose. Therefore, Education as preparation for employment must be considered within the framework of several other aspects of education, many of which with reasons for existence over and beyond those relating to preparation for employment.

To establish a generally recognizable frame of reference, Education is discussed around a concept of levels in relation to the settings in which Education takes place, rather than age categories of those whom Education seeks to serve. This organizational approach has some serious weaknesses.

Elementary and Secondary Education

Elementary and secondary education, both public and private, are considered together because in terms of their basic contributions to preparation for employment they vary only slightly. These differences will be discussed specifically.

Preparation for employment as a goal of Education begins on the first day a youngster enters school—be it first grade, kindergarten, or even such preschool experience as offered by Operation Head Start. The three basic kinds of learnings to be imparted during the elementary and secondary school period are those relating to (a) work and the working world; (b) self; and (c) basic skills, knowledges, and understandings which will permit adaptability and flexibility in a rapidly changing society.

Society has charged Education to teach youngsters *to* work, *about* work, and about the working world. However, if teachers today are to acquire the relevant basic knowledge required to meet these essential student needs, major changes are needed in elementary and secondary teacher education programs. Less and less can students expect to receive adequate information in this area from their parents, and both elementary and secondary schools must incorporate in curricular content both informational and attitudinal materials. Work must be perceived as respectable, as intrinsically rewarding, and as an activity. Students need to experience work as well as think about it, with the world of work understood to some degree both in terms of what youngsters are likely to encounter and in terms of possible opportunities. Because youngsters cannot be expected to learn about the real world of work if they are quarantined in a school, major changes are needed: Representatives from labor, business, and industry must be brought into the schools and opportunities must be provided for both elementary and secondary school students to visit business and industry. Local employment opportunities need to be emphasized, especially in secondary school. At the same time, opportunities beyond the local level must be made known to youth during their school years. Geographic discrimination in occupational choice is, in many ways, a more serious problem than racial discrimination, and should be recognized as such.

A second societal charge to education is to inculcate youngsters with a desire to *be* someone, in part through becoming *something*. Too many elementary and secondary school students believe they are not worthwhile because they do not really know who they are. In our age, each of us is constantly challenged to do his best, and our students must somehow be made to recognize and accept this challenge. They will not do so automatically, and to effect this, major changes in teacher education programs are again necessary.

For example, the personal values of too many teachers are based on the avoidance of failure through "safe" decisions. The communication of such values to elementary and secondary school students risks the result of vast underdevelopment and inadequate utilization of talent. Youngsters must be taught that they must risk failure in order to have a chance for success. If they can be made to realize they *are* worthwhile, failure need not be a major psychological disturbance. Thus, the time devoted to teaching students to learn about themselves represents a direct and major contribution of elementary and secondary education to preparation for employment. They must be taught the concepts of the responsibilities which accompany rights, a higher level of occupational aspirations than those illustrated by adult role models in many neighborhoods, and sufficient understanding regarding abilities and aptitudes. If these things can be taught, risk becomes a natural and integral part of the decisionmaking process.

The major thrust of elementary and secondary education as preparation for work must be directed toward providing the basic educational skills and understandings prerequisite to the acquisition of specific competencies in a wide range of occupations. This statement has multiple implications: First, elementary and secondary education should be perceived as general education for all youth in terms of basic purposes and content; second, the most basic vocational preparation courses are in the so-called "academic" areas—the language arts, social studies, science, and mathematics; third, such courses must be presented so as to offer maximal learning opportunities to all—we can no longer say, for example, that some students are incapable of mastering basic concepts of science or mathematics.

Three primary factors justify a major emphasis on general education in elementary and secondary education. First, job skills required for entry in an increasingly complex occupational society demand basic mastery of fundamental learnings. To attempt highly specialized training in the absence of basic understandings invites waste and inefficiency in training operations. More serious, it is dishonest to those attempting such training since such an absence leads to aspirations whose probable fulfillment is but slight.

Second, the certainty of uncertainty in today's occupational structure makes it mandatory that elementary and secondary school youth receive an education which will serve as a basic foundation for training in more than one specific job. The probabilities are high that these youth will change occupations and consequently undergo retraining more than once in their adult lives. Therefore, they need the basic education which will enable them to do so.

Third, most high school students have not matured sufficiently to make appropriate specific vocational decisions. That they can, if asked, make some kinds of decisions is irrelevant. Lacking both maturity and needed information, it is unfair to ask them to commit themselves to a specific occupational area early enough for specific skill training to be appropriate during the high school years.

It is highly unlikely that a good secondary school could exist which set no curricular restrictions on student choice. The operational issue is not whether students should be allowed to study what they want, but rather, with the number and nature of restrictions on their opportunity to choose among electives. As the student progresses from elementary through secondary school, a conscious attempt is made to broaden the number of choices available. By so doing, we hope to provide better for individual differences and, at the same time, further develop maturity in the sense of accepting responsibility for decisionmaking. In the elementary school, general education can be expected to take up a large portion of the schoolday. In the secondary school, this emphasis should also occupy a major core of time in spite of the fact that elective opportunities should be increased. Thus, general education should be emphasized for all, and acknowledged without apology, irrespective of what the student may say he wants.

At the same time this recommendation of an emphasis on general education for all does not mean that the same content should be taught in the same classes by the same methods with the same texts, nor necessarily even by the same teachers. This would most certainly result in an increase in the dropout rate in the secondary school and consequently reduce its major contributions to preparation for employment. Needed are many types and levels of courses in basic academic areas designed to meet the differing academic requirements of the varied secondary school population. In this respect, instructional materials and curricular plans are currently far ahead of typical educational practice. The large and serious gap between possibility and normal practice must be quickly narrowed if we are to meet effectively the needs for general education described here.

Increased emphasis on general education in the secondary school does not imply that it abandon vocational education. However, it is recommended that the nature and function of secondary school vocational education undergo major changes made possible by passage of the Vocational Education Act of 1963, including (1) a sharp decrease in curriculums leading towards job skills at the skilled worker level; (2) a sharp increase in course offerings designed to broaden the perspective of vocational education students regarding a variety of occupations, along with rudimentary training applicable to a number of occupations; (3) a sharp increase in training programs in the semiskilled and service occupations and in work-study programs (not student exploitation) for those whose abilities will not allow them to function at a higher level; (4) a marked change in course offerings and content to accord with changes in the occupational structure; (5) a marked attempt to incorporate vocational education offerings into the total curricular structure rather than treating them as separate and distinct; and (6) a definite program designed to lead the majority of high school vocational students toward post-high school vocational education.

Thus, a change rather than a decrease in emphasis in high school vocational education offerings is recommended, *a change, in effect, from asking students for a commitment to vocational education to asking vocational education for a commitment to students.* These recommendations are intended to pose a challenge—not a threat—to vocational educators. There is a need for more, not less, high school vocational education. As we strive for more, we must be constantly aware that qualitative changes are at least as important as quantitative changes.

There are also major differences in students who hope to profit from time spent in elementary and secondary schools as a setting which can contribute positively toward preparation for employment. Almost all who utilize educational programs come from elementary and secondary schools. Yet this commonality of educational background is deceptive in terms of differences in the student population.

In the elementary school, differences in educational experiences related to preparation for employment largely reflect differences in ability of students to profit from instruction. Not all students are exposed to the same general experiences nor will they attain the same level of achievement, but all will be subject to essentially the same kinds of educational experiences. As youngsters enter the secondary school, with its course and curricular electives, this changes markedly.

Perhaps as many as 35 to 40 percent of secondary school students will be headed towards colleges and universities. These "college-bound" students can expect to continue the same major emphasis on general education which characterizes the elementary school experience.

Another 40 to 50 percent will be headed toward specialty training beyond high school in noncollege or university settings. In addition to the specified general education core, these students are most likely to elect general exploratory vocational education courses. These "specialty-bound" students can be expected to learn a little about a rather wide variety of occupations, but not much about any specific occupation.

Between 10 and 25 percent can be expected to seek immediate employment upon leaving the secondary school. These are the students who spend a part of each schoolday acquiring specific skills at a minimal competence level in semiskilled trades, business education, or service occupations. Like all others in secondary schools, these "immediate employment-bound" students should be exposed to a solid core of general education.

In each of these three classifications, some will graduate from high school and others will drop out. Thus, we have six groupings against which other educational opportunities will be considered. These categories have been devised despite the obvious dangers in generalization and probabilities for error inherent in efforts to classify students in any one grouping. However these dangers are considered worth the risk in the hope that appropriate additional educational opportunities will emerge for different persons in terms of diverse purposes and functions.

The Public Area Vocational School

The publicly supported area vocational schools are currently undergoing rapid growth and expansion. In this respect, they differ little from several educational facilities other than elementary and secondary schools. Like other rapidly expanding systems, public area vocational schools vary widely in programs, apparent purposes, and students they seek to serve. Rather than describing differences in current practices, we will concentrate primarily on the unique ways this kind of opportunity can fit into Education as preparation for employment. Many—including some who direct public area vocational schools—are expected to disagree violently with the perceptions of role and function presented.

The public area vocational school can best be justified as an institution designed to provide vocational training in trade, technical, and business occupations at the skilled worker level. Its graduates should be ready and eager to assume responsible positions in our occupational society.

The organization of the public area vocational school can be viewed from several perspectives. Operating properly, it should fit into a pattern of other area vocational schools within a State or region. That is, ideally area vocational schools within a given State should not duplicate offerings of other area vocational schools. Instead, a system of public area vocational schools, each established and operated to meet the needs of *different* parts of our occupational society, seems highly desirable. It follows, then, that the master plan for a State system of area vocational schools should provide that each school be available to all eligible residents of the State. Student dormitories must then be included in cost estimates for plant construction. If, however, the addition of a dormitory system can result in avoiding, to a large extent, duplication of educational offerings, very real and sizable financial savings can be realized.

In addition to financial savings, there are other reasons for recommending an essentially nonduplicating State system of area vocational schools. Chief among these is the potential such a system holds for meeting needs both of employers for a continuing supply of truly well-qualified workers and of individuals for acquiring specific job skills and marketing them beyond the borders of the local community. Another advantage lies in staffing. Since it is extremely difficult to find highly qualified instructors in the skilled trade, technician, and business educational fields, the concentration of staff members well-qualified in a particular occupational area in a single school holds greater potential for a quality training program. Such programs also become readily known to employers throughout a State or region needing workers with a particular skill.

Finally, such a State system enables the implementation of the concept of modification of curriculums offerings to accord with changes in our occupational structure, as called for in the Vocational Education Act of 1963. It is, for example, much easier to abandon one program in one school than it is to discontinue one program in every school. Moreover, need can be determined on a more stable basis if it is done on a statewide rather than local basis.

Curricular and course offerings in the public area vocational school should be consistent with the school's reason for existence—preparation for direct employment. Thus, while building on the general education and vocational exploration prescribed for elementary and secondary education, it shifts emphasis. If and when basic mathematics, basic concepts in the physical sciences, or English are taught in the area vocational school, they should be designed to meet the remedial needs of those who failed to grasp them in high school rather than as core subjects for each student.

This is not to say that courses in these so-called "academic" areas should not be taught in the area vocational school, but rather, where they are *required*, they should be taught at a level more advanced than secondary school. Such courses are particularly crucial in training skilled technicians for employment in subprofessional occupations. Some area vocational schools should become high-quality technical institutes devoted largely to preparing skilled technicians to supplement and aid professionals, although this should not become the primary or major emphasis. This subject will be discussed further in context of the community college as preparation for employment.

The student population in the public area vocational school can be expected to vary widely in age and educational background, and entrance requirements should take into account. Primary emphasis of these schools, as public institutions, should be on initial training for employment, with a secondary emphasis on adult retraining. Therefore, the day school student body can be expected to have a modal age of less than 20 years and be largely composed of recent high school graduates. The vast majority will probably be specialty-bound high school graduates, with much smaller proportions coming from the college-bound and immediate employment-bound segments.

Not all public area vocational school students, however, can be expected to be recent high school graduates. Some will be high school dropouts. Provision should be made for these dropouts, including remedial basic education courses needed to master occupational training. Other students will have dropped out of either junior or senior colleges after discovering that their talents, motivations, and interests are better served by the area vocational school. Some will have sought immediate employment after high school only to discover that the absence of specific skills limits their chances of securing stable and financially and personally rewarding employment. The area vocational school should prepare for all of these kinds of potential students.

Most students in public area vocational schools will be not only specialty bound but also specialty oriented in their educational motivations. They enroll in an area vocational school after making a particular occupational choice with the desire to acquire the necessary skills. While their educational motivations are often very strong, they differ markedly from the liberal arts-oriented college or university undergraduate in that they want specific job skill training, not general education.

Students in area vocational schools must be viewed as persons who *can* and *will* seek preparation for employment. They can be assumed to have accepted both the desire for gainful employment as a personal value, and the challenge to assume responsibility for their own actions. Further, they can be viewed as wanting to care for themselves, willing to make a great personal investment to do so, and able to take advantage of an opportunity to implement vocational decisions *they* have made. While these students are expected to need comprehensive counseling and guidance, they are assumed to be able to profit markedly from these services. These people are important in our total potential occupational society. In meeting their educational and training needs, the area vocational school has a vital role and function.

The Private Trade, Technical, and Business School

Private trade, technical, and business schools have played a vital and significant role in American education for many years. Whether operating as profitmaking or nonprofit institutions, the major portion of operating expenses comes from student tuition fees. While other free or nearly free educational opportunities exist in great numbers at the present time, the private trade, technical, and business schools, with the considerable financial investment they require of students, are expected to continue to make significant positive contributions to the total pattern of American education. They certainly deserve careful discussion here.

Much of what has been said regarding the organizational structure and student body of the public area vocational school applies equally well to the private trade, technical, and business schools. In some respects, it is even more applicable to the private than public school system at the present. That is, the private schools have been established for the specific purpose of preparing persons for employment. They make no pretense to existing for other reasons. They enroll specialty-oriented students for preparation in specified, chosen occupations who are willing to make a considerable personal and financial investment to exercise their right of freedom of occupational choice. Curricular and course patterns are designed to meet employer needs and organized to provide students with maximal specific job skills in a minimal amount of time. The typical private trade, technical, or business school offers a relatively narrow range of curriculum choices but provides courses leading to differing levels of occupational competence. A majority of the students are young high school graduates preparing for initial entry into the labor market at the skilled worker level. Some also fit into the groups described as public area vocational school students.

Thus, the private trade, technical, and business schools are designed to meet educational and training needs of the same segment of our population attending public area vocational schools. They are, therefore, in competition with the public area vocational school and with each other, with their survival depending on their ability to compete. In view of their substantially greater tuition cost, questions can be raised regarding this ability and their unique contributions to the total system of American education. Rapid growth of public area vocational schools can be expected to reduce the number of private trade, technical, and business schools. Those that survive will honestly and effectively meet each student appeal outlined below.

One reason the private trade, technical, and business schools appeal to students is the efficiency of their operation. Emphasis is placed on preparation for employment in the least possible time, taking the most advantage of their students' motivation to receive an adequate educational return from their financial investment. In the good private school, students acquire adequate occupational skills so rapidly that some contend the actual real cost to the student is less than that of the public area vocational school. Added job earnings, they say (accrued while public area vocational school students are still in training), more than offset relatively high tuition charges.

The wide variety of course offerings also affects student enrollment in these schools. At least at present, they make available many more types of training than publicly supported institutions. This is not to say that a wide choice of training opportunities could not be found in publicly supported institutions somewhere in the United States; however, these may be neither known nor readily available to prospective students in particular locations. Prior to passage of such recent legislation as the Manpower Development and Training Act of 1962, the Vocational Education Act of 1963, and the Economic Opportunity Act of 1964, the private trade, technical, and business schools represented for many recent high school graduates the only known source for acquiring post-high-school training in settings other than the college or university. In many communities, this is still essentially the case. Even where the situation is rapidly changing, the private school represents one additional opportunity for choice to those seeking preparation for employment, for the imaginary geographic boundaries do not limit enrollment here. The ways in which the private school is organized to take into account students' educational motivation also contributes to student enrollment. For example, many private schools employ small instructional units which make entry possible at almost any time the student decides to seek training, in many cases within a week of the time interest is expressed. Contrast this adaptation to clientele with the inflexibility of publicly supported schools, where closed doors between formal registration periods have effectively discouraged many potential applicants.

Another example is found in the system of additive occupational skills underlying the curricular organization in many private schools. This is designed to take advantage of immediate educational motivation while simultaneously making it extremely easy for the student to broaden his educational aspirations during the course of training. The student who enrolls with a simple desire to become an office machine operator may extend his goals through the ready availability of such allied courses as IBM key punch operation, accounting, and business administration.

Perhaps the strongest appeal of the private trade, technical, and business schools lies in their real and claimed potential for placing graduates in jobs, a potential which springs from many sources. First, the private school owner is highly motivated for survival reasons to place graduates since it is on this success that his school is typically evaluated. Second, many private schools, because they have been in operation for many years, have extensive employer contacts. Third, the free enterprise operation of the private school appeals to many employers who are likewise involved in free enter-school owners to change course and curricular conscious and continuing efforts of many private school owners to change course and curricular content in accordance with employer needs. The system of almost continuous enrollment, resulting in an almost continuous production of graduates to meet employer needs as they arise at specific times, constitutes a fourth factor. A fifth way private schools have sought to meet job placement expectations of prospective students has been the conscious attempt to extend to a relatively wide geographic area not only student recruitment but also job placement activities.

This discussion of the appeal of private schools for potential students illustrates some reasons why some will continue to operate successfully in spite of greatly increased opportunities for free or even subsidized education. It should provide a basis for discussing possible changes which publicly supported institutions might consider making, since much can be learned from the successes of the private school. It is also hoped that the freedom of students in a private school to choose and commit themselves to an occupation will demonstrate the value of utilizing educational motivation in preparing people for employment.

Finally, this discussion was intended to illustrate the unique place of private trade, technical, and business schools in the total pattern of educational opportunities. Changes as part of general public policy cannot be recommended because these institutions are not under public control. However, if they are to continue to play a signficant role in the total pattern of education, they will obviously continue to recognize and take advantage of the kinds of appeals to students outlined here.

The Community College

The community college, like the public area vocational school, is currently undergoing rapid growth and expansion. Since both are largely supported by public tax funds, a substantial emphasis will be placed upon ways in which they differ in preparing for employment. Those views presented here can be expected to be met with strong disagreement on the part of some of those responsible for operation of community colleges since large disparities exist between many actual and recommended practices.

On the one hand, the community college can be viewed as a college transfer program, and on the other, it presents an opportunity for terminal vocational education at the post-high-school level. However, certain common elements in organizational structure and appeal to students should be recognized.

First, it is important to focus on the word "community," for the community college relies heavily in its basic justification on meeting the needs of those residing in the specific, restricted geographic area it serves. Its "customers" are readily identifiable, and their educational needs amenable to clear-cut study and analysis. The community college usually depends to a substantial degree on locally produced tax revenues for support and operation, and is strongly under the influence of local as opposed to State or national control. Even where large amounts of financial support come from State sources, the concept of the community college as an institution meeting needs of a particular "community" is often strongly emphasized.

Second, the word "college" is significant. In our culture, "college" has taken on almost mystical connotations of "a good thing." A college brings status to its community, and it can, with relative ease, attract good secondary schoolteachers as a pool of potential staff members. It allows students to refer to and think about themselves as "college students"—including those in terminal vocational programs, who really are not. The word "college," therefore, has an undeniable appeal on other than sound educational bases.

However, the community college has legitimate educational justification as well. One is its geographical convenience. A second is the minimal financial investment required of its students. Perhaps its most important contribution as a unique part of American Education lies in its built-in provision for wide individual differences in students and for the flexibility with which it allows them to revise educational-vocational decisions as they progress. In terms of wide-range adaptability, the community college has more potential than any other segment of post-high-school American Education.

As a college transfer program, the community college concentrates primarily on the general education typical of the first 2 years of a liberal arts college. Two years in a community college transfer program is strongly emphasized as "equivalent" to the first 2 years in a 4-year liberal arts college. If, however, it is equivalent, what is the justification for both kinds of institutions; and what unique educational advantages does the community college have as a college transfer program? First, it allows the student to test the appropriateness of his college decision without risk of a sizable financial burden. Second, the student can operate in a fairly familiar physical environment. Third, the individualized attention and personalized approach made possible by the small staff-student ratio in many college transfer programs is difficult to duplicate in the 4-year liberal arts setting. Finally, if the student finds himself unsuited for college work, he has alternative educational routes available in the community college which do not require him to change schools. The community college as a college transfer program does not expect immediate placement of its graduates in the labor market; but nevertheless, it makes substantial and significant contributions to preparation for employment by readying many students for further undergraduate and graduate work at other institutions.

As a terminal vocational education program the community college makes its most immediately direct and obvious contribution to preparation for employment. In considering this aspect, terminal programs in the community college and area vocational schools should be compared to determine the differences in and advantages of each program. Comparisons will be made in terms of possible rather than currently existing programs.

The terminal vocational education program of the community college, like the area vocational school, should concentrate on preparing students at the skilled-worker and technician levels. The potential of the community college is especially high for training its students as skilled technicians and semiprofessional workers.

In the first place, high level technical training involves postsecondary school preparation in basic academic disciplines as a concomitant to acquiring specific job skills. With a competent staff of academic personnel already in the college transfer part of the curriculum, the community college appears to be in an ideal position to offer this high-quality technician training.

Second, it may be reasonably expected that relatively more of those enrolling in community colleges will aspire to becoming true technicians than would normally be found in the area vocational school. That they choose to attend a "college" rather than a vocational school may be significant.

Third, the community college has a pool of potential students for technician training among those who find the college transfer program incompatible with their interests, values, or abilities. Since such students are already in the setting, and often in the same building, movement from a college transfer to a technician training program could be made with maximum ease. Therefore, it seems logical to recommend that community colleges seriously consider offering high-level technician training.

At the same time, the needs of the community must be kept clearly in focus as curricular programs are formulated in the community college, at least to the extent that the college is largely funded through local resources. Therefore, in some community colleges true technician training may not be highly desirable if such workers are not needed locally. Thus, the orientation of terminal vocational education programs in the community college, to a much greater extent than that of the area vocational school, should stem from local need for skilled workers. Similarly, because of the community college organization and structure, students will primarily be local, and many will expect to remain in the community upon completion of their terminal training programs. As a result, it should not be considered unusual or inappropriate to find some community colleges offering terminal vocational training programs similar to those found in the area vocational school. In such instances, community college students can be expected to find more limitations in the variety of programs offered, geographic region from which students are drawn, and placement potential. In any event, any terminal vocational education program in the community college must be viewed as truly important rather than as something to be tolerated by the junior college staff.

The community college can expect to draw heavily from both college-bound and specialty-bound high school graduates. It seems reasonable to expect that a large majority of day school students enrolled in the community college will consist of recent high school graduates. While those in the college transfer portion are relatively more uncertain about ultimate educational-vocational goals and less able to afford a college education than students in 4-year colleges, there is no apparent reason to expect that they will be less academically able than freshmen and sophomores in State-supported 4-year colleges. Students in community college terminal vocational education programs will probably have financial problems similar to those in the college transfer program. Emphasis on expected financial need illustrates a possible greater need for work-study and student loan programs in the community college than in either the

4-year college or the area vocational school. In an educational setting such as the community college, established for local persons based on local needs, the potential for good work-study programs seems high.

No a priori reason exists for assuming that the community college *must* be organized around local community needs and operated largely under community auspices. A statewide network of community colleges could be considered, similar to a statewide network of public area vocational schools. In terms of the college transfer program structure, very similar programs would be expected to exist in the various community colleges, in spite of the fact that relative emphasis could vary considerably from one college to another. In terms of terminal vocational education programs, a statewide system of community colleges drawing on State rather than local funds for financial support might offer distinct training programs in different institutions which would be equally available to all qualified applicants residing within the State. If this were done, the need for student dormitories would parallel that stated for public area vocational schools. If a statewide system of community colleges were established where a system of public area vocational schools existed, relative emphasis on trade, technical, and business education should be coordinated between the two systems as well as within each system.

Whether the community college is organized around local, State, or regional needs is, in one sense, irrelevant. That is, this program, like all others associated with education, must find its eventual justification in the ways and extent to which it meets *student* needs. If this means anticipated student outmigration from the community, community college planners must have sufficient concern for students to recognize this.

Much controversy currently exists concerning roles and functions of community colleges and public area vocational schools. To the extent that they offer duplicative programs designed to appeal to the same students and using public tax funds, roles and relationships should be considered more broadly than can be expected from administrators of either program. A similar controversy exists between the college transfer part of the community college and 4-year State colleges, with the rather poor justification of the community college simply being overcrowded conditions on the 4-year State college campus. If emphasis is placed on their *community* role a logical rationale of the place of the community college in the total pattern of educational opportunities can be easily made. If emphasis is shifted from the community, then much imaginative and creative work remains to be done before a unique role and function for the community college can be clearly spelled out.

Colleges and Universities as Preparation for Employment

The crucial and vital role of colleges and universities in preparing students for employment is, in some ways, too obvious to need mentioning. In other respects, it is so complex that it defies definitive discussion in a document such as this. However, some brief remarks are essential if American education as preparation for employment is to appear in proper perspective.

Much of the impetus responsible for the current rapidity of change in our occupational society comes from colleges and universities. Individuals dedicated to formulating and transmitting new knowledge are highly concentrated in colleges and universities, and their progeny are most likely to continue developing this new knowledge in the employment setting as leaders and workers. Colleges and universities are perceived not only as places where individuals can acquire occupational skills, but also where the desire to acquire and produce new knowledge and the capability for reasoning is developed to the highest possible degree. There are developed the leaders who will direct the job activities of many others. It is a setting in which the greatest possible freedom of choice is provided to students in recognition of the major responsibilities they are expected to assume in utilizing their skills and their talents. The colleges and universities represent, therefore, the portion of our formal system of Education which calls for the highest levels of ability and which has the potential to produce individuals most likely to make meaningful societal contributions.

The self-images derived from thinking about one's potentialities as a college graduate are naturally and logically appealing to large segments of our population. As a result, the proportion of high school graduates seeking to enter college has increased. From the point of view of our increasingly complex occupational society, this boom in college enrollment is certainly justified, although the same cannot be said of the qualifications of all those seeking to enter college. The need to develop fully individual potential likewise justifies current nationwide attempts to encourage college attendance; but many have false impressions of the magical power of a college degree and of their own abilities. Some should more appropriately seek other forms of Education. A much better perspective that can be provided here is needed.

As more knowledge is accumulated, general education in the college and university setting is naturally and inevitably increased. In conjunction with this, many professions and occupations have become so complex that they demand a period of years of occupational specialization independent of any emphasis on general education. Both these factors have led to patterns of college and university education which increasingly emphasize general education at the undergraduate level and dramatically intensified graduate-level instruction aimed specifically at development of occupational competence. This is observable in many, although not all, areas of occupational competence for which our colleges and universities prepare workers. The result has been an increase in the length of time required to prepare people for work, with corresponding increases in the personal and financial investments required of those who seek a college education.

The emphasis on general education characterizing a significant portion of undergraduate college work implies the existence of concrete expectations for broadening the influence of college graduates beyond their occupational activities. It also indicates that the goals of college and university education at the undergraduate level *extend considerably beyond preparation for employment.* Those who primarily or exclusively emphasize a desire to acquire occupational skills as a reason for attending college are forced by our undergraduate patterns of education either to develop broader and more comprehensive reasons for attending college or subject themselves to a great deal of personal frustration and dissatisfaction to complete the undergraduate degree. In no facet of Education is the attempt to indoctrinate students with a particular set of personal values more deliberate than in the undergraduate college.

At the same time, in no part of Education are people given a greater opportunity for developing individuality than in the undergraduate program, nor greater means for expressing individuality than in graduate programs. As a result, the total college and university setting represents the ultimate in both general education and occupational specialization—the ultimate in demands for conformity and encouragement of individuality.

Individuals who seek a college or university education should be those secondary school students with the greatest ability to profit from academic instruction. Not all high-ability secondary school students should be expected to find a college or university education either appealing or appropriate, nor will all college-bound high school students necessarily want or be wanted by colleges. On the other hand, some specialty-bound and even immediate-employment-bound will undoubtedly eventually find their way into our colleges and universities. If current trends continue, an increasing number of college students will be junior college transfers.

Society has given us a general cultural bias which leads to perceptions of colleges and universities as places for maximal development of talent. Congress has also enacted several laws making it possible for increasing numbers of youth to meet this cultural expectation. Our colleges and universities have clear-cut responsibilities to implement general societal and individual expectations reflected in the current marked increases in college enrollment.

As part of this responsibility, colleges and universities must devote more thorough deliberation to their role in preparing students for employment. They must also help those seeking to enter perceive as clearly as possible the nature, goals, and expectations of college attendance with relation to individual potentiality for meeting precollege requirements. Conscious attention must also be devoted to helping undergraduate college students engage in a continuing process of self-study regarding the appropriateness of their attending college. Thus, our colleges and universities are being challenged to make the greatest possible contribution to preparation for employment consistent with the total pattern of potentialities for achieving this goal which exist in all of American Education.

There is danger in the tendency to equate maximal development of talent with maximal development of individual potentiality. Those who make this error often claim that the best way for the highly intellectually able to prepare for employment is to complete a college program. An illustration of this can be found, for example, in the wording of the National Defense Education Act of 1958. That this is a serious error should be obvious to all who think broadly about the problem. Consideration of academic aptitude as a determinant of beneficiaries of a college education should be extended to identification of those for whom completion of a college degree program appears *possible*, rather than limited to identification of those for whom completion appears highly probable. Academic aptitude as a predictor of college success has failed to demonstrate its rightful claim to the high weighting some tend to give it in decisions relative to appropriateness of the college decision. There are some individuals with very high academic aptitude for whom maximal development of individual potentiality can best come through means other than college attendance. Qualities other than academic aptitude—including interests, motivations, values, and environmental background—must also be considered with respect to maximal development of individual potentiality. Maximal development and utilization of *talent* is not equivalent to maximal development and utilization of *individuals*.

In relation to the total pattern of preparation for employment, the college dropout must be considered. There seems little likelihood that the college dropout rate is likely to be substantially reduced in the years immediately ahead. While the challenges posed in the preceding paragraph are too great to be met quickly or easily, the college dropout cannot be ignored in terms of the total problem. More concentrated and intelligent effort should be directed towards helping college dropouts plan better alternative routes to prepare for employment than exist in typical practice today. Many college dropouts are extremely intellectually able persons who fail to complete their college degrees for reasons other than lack of academic ability. Even those with academic aptitude less than that required for successful completion at a particular college have, in terms of the total population of prospective workers, a distinctly better than average potential for successful employment or different educational experiences. These dropouts should be given ample opportunity to explore other educational avenues as preparation for employment. This, then, poses an additional challenge for our colleges and universities.

Self-Study as Preparation for Employment

Historically, self-study as preparation for employment has been a very important mechanism used by many to prepare for entry or advancement in the work world. With the increasing complexity of our occupational society, this approach is inevitably decreasing in emphasis. Yet, it has certainly not disappeared, and is unlikely to do so as long as people retain a strong desire to better themselves.

Two primary approaches to education for employment are involved here. The first consists of self-study programs formulated by individuals in line with their vocational interests and aspirations. Because such activities vary so widely, they defy discussion. The second consists of various kinds of home-study courses offered under some sort of formal course and/or curricular structure. It is this second activity which will be briefly discussed here.

Home-study courses—sometimes referred to as "correspondence study"—are as suspect in the eyes of the general public as the private trade school because of the doubtful value of many except as a source of financial gain to their sponsor. However, this does not mean that home-study courses have little value as preparation for employment. There are too many concrete examples of persons who have achieved considerable vocational success after completion of home-study courses to deny the possible usefulness of this approach.

The structure of the sponsoring organization is important in assessing the potential contributions of home-study courses as preparation for employment. For example, these courses are more apt to be valuable when they are offered as an extension of an ongoing residential program under supervision of faculty members intimately tied to residential instruction. Arranged in sequence of units which are further subdivided into many smaller sections, each constituting a "lesson" for the student, these courses typically call for student participation, including the completion of assignments in a form that qualified instructors can evaluate. The pertinence of these assignments, the ability of instructors to evaluate student reports, and the conscientiousness of the instructors in carrying out their responsibilities are of key importance in assessing the possible value of a particular home-study course.

Another major factor is the student. Those who profit most from home study have a high degree of self-discipline, perceiving the course as having a basic rather than incidental importance, and establishing a regular work schedule to complete assignments. In addition, they generally have a high degree of interest in the courses they are studying, and devote independent thought to their subject beyond that required simply for completion of assignments. They certainly have strong desires for self-improvement and perceive the home-study course as a means to fulfillment. Even the best organized and conducted home-study course is of little value unless students have these qualities. Such characteristics are, of course, desirable in all students; however, in home study, the instructor has little control over their presence or development.

Very few people, including those who sponsor them, would claim that home courses as an approach to education for employment are equal to or better than classroom study. They are, however, defended as a means to self-improvement for those for whom other avenues are not available.

Adult Vocational Education in Public and Private Schools

Before adult vocational education as it applies to a number of settings in Education can be discussed, basic concepts and assumptions should be reviewed. We refer to adults who seek opportunities to improve their lot in our society through adult vocational education. The majority continue to hold jobs while pursing their studies, although a few voluntarily leave their current jobs in order to do so. More importantly, these are people who decide to prepare for a particular kind of employment and assume personal responsibility for implementing these decisions.

Adult vocational education can be defined in terms of two broad training objectives: (a) To upgrade vocational skills to meet changing job requirements in particular occupations; and (b) to retrain, to help people move from one occupation to another. Of these, the first is the objective much more frequently, and in view of the introduction of such non-Education programs as those proposed by the Economic Opportunity Act and the Manpower Development and Training Act, this situation is likely to continue.

The need for workers to continue learning more about themselves and their occupations is manifest in many forms and at many levels of our society. While the establishment of new occupations and the demise of old occupations are highly publicized, they are relatively small when compared with changes in knowledge and skill requirements taking place *within* occupations which are neither new nor disappearing. The situation facing many employed workers today is not that their occupations are becoming obsolete, but rather that they are becoming obsolete in their occupations. The rate of discovery of new knowledge makes it obvious that the time is past when education as preparation for employment can be viewed as necessary at only one stage in life. Rather, we must recognize the responsibilities of Education not only as preparation for initial employment but also for upgrading skills and knowledges of employed workers. As a part of continuing education, adult vocational education must be considered as an important aspect, and not an incidental service, of Education at many levels.

Of key importance is adult vocational education in elementary and secondary school settings as places close to all who work and want to work. Particularly appropriate offerings for these settings is basic education in the fundamental academic skills: The language arts, science, mathematics, and social studies, which will be needed by adults as a basic foundation to skill training sponsored by their employing organizations.

Adults should also logically be offered basic vocational skill training similar to that provided in the regular high school vocational education programs which lead to employment in semiskilled and service occupations. This is feasible in terms of physical facilities, probable availability of staff, and length of time required for training. Where such programs are undertaken, close attention should be paid to local community needs, since it should be assumed that students pursuing this kind of adult vocational education program will remain in the local community.

Skills learned through secondary training remain useful or in demand only a limited number of years before retraining due to changes in occupational structure is necessary. However, planners of adult vocational education programs in secondary schools should be little concerned with upgrading vocational skills as an instructional objective since skills which the secondary school is best equipped to teach will probably be upgraded as needed on the job. Moreover, the typical secondary school will not be prepared to assume the task of upgrading skills at the skilled-worker level, nor should they be expected to do so.

However, public area vocational schools, community colleges, and private trade, technical, and business schools are well equipped in terms of both staff and equipment to offer night training to upgrade the skills of those employed at the skilled-worker level. In addition, they can and do serve a highly useful function in assisting those who have been out of the labor market to gain the skills which will allow them to compete successfully in the current world of work. However, in view of the potential of elementary and secondary schools in meeting remedial basic academic needs, these should be considerably less emphasized in the area vocational school, community college, and the private school setting.

The community college is also ideally suited for offering liberal arts courses to adults in the community wishing to explore their capabilities for and interest in a college education. Such offerings should conform to academic standards of the full-time junior college program rather than general cultural enrichment courses which may also be included in a junior college's evening school program.

The 4-year college and university setting also has a vital role in adult vocational education by upgrading and updating occupational skills acquired by former undergraduate and graduate students. Perhaps it would not be unwarranted to say that professional workers today are always behind in acquiring new knowledge in their area of specialization. The colleges and universities which contribute so much to the development of new knowledge cannot ignore their responsibilties to communicate some of this knowledge to former students now gainfully employed in the labor market. The development of centers for continuing education is becoming rather commonplace—in university settings, at least. Such centers engage in a variety of activities, including special lectures, short courses, extension and night schoolteaching, and production of written reports, designed to upgrade and update former college students.

III. SUPPLEMENTARY EDUCATIONAL EXPERIENCE

Introduction

Whether formal Education *could* prepare people for employment is debatable. Whether it *is* doing so is not debatable because a wealth of evidence indicates that it is not. Society in general has been unwilling to make Education totally responsible for such preparation, and, as a result, many other educational opportunities have been developed outside of Education. Some of these are setting oriented and involve many kinds of programs; others are program oriented, and involve a number of different settings; all are discussed here to present as comprehensive a picture as possible of their nature and potentialities.

Business- and Industrial-Sponsored Vocational Training Programs

Business and industrial organizations have engaged in vocational as well as other kinds of educational training for a number of years. The reason for existence of these programs and their basic mode of organization are clearcut. Both deserve a brief discussion.

Several factors characterize a sound vocational training program sponsored by business or industry. First, the vocational skills being taught will help the sponsoring organization make more money. (There is no apparent valid reason for assuming a private business organization should sponsor vocational-skill training for general philanthropic or societal reasons independent of the welfare of the organization.) Second, the skills in which training is provided will probably be of obvious value to the sponsoring organization and (hopefully, from the company's point of view) of less value to other possible employers. Third, distinct reasons should exist why it is more feasible to train workers in these skills within the organization than to hire workers already possessing such skills from outside. For example, particular skills may be unique to the needs of the organization and not taught in any other setting. Or, the organization may find it impossible or highly undesirable to discharge employees with unneeded skills and wish to retrain them. There should also be reasonable assurance that trainees possess both the ability and desire to complete training and, in addition, plan to remain with the organization after training or follow some other plan consistent with the best interests of the organization. Finally, the training plan itself should be efficient and organized in a way to be minimally distractive to other operations.

Training may be designed either to upgrade or update skills, since both are important to building or maintaining a favorable competitive position. Such training may exist at almost every level of vocational skill existing within the organization, from the lowest level semiskilled operatives to top-level executives. Vocational skill training to allow individuals to change occupations within the organization is found considerably less frequently. Where it does occur, it typically comes at the semiskilled-worker level, although currently considerable effort seems also to be aimed at developing technician-level employees from within the work force of the organization. If adequate numbers of qualified technicians were available from other sources, this would not be as likely to occur.

Persons in whom business and industrial organizations decide to invest their training dollar should possess personal qualities similar to those formal education attempts to instill in its students. Specifically, they should desire to pursue gainful employment as a strong personal value. They should be willing and eager to change themselves to stay abreast of changes in our occupational structure. They should want to learn and be willing to make considerable personal (even though not financial) investment in securing new knowledges and skills. They should be desirous of developing their ability to make the most meaningful work contributions. In short, rather than having in any sense rejected formal Education, they should be persons who have chosen the organization-sponsored training over any other available opportunities. In this sense, their educational needs as preparation for employment cannot be best met by formal education.

Business and industrial organizations make several other valuable contributions to the total task of educating persons for employment. Chief among these are their contributions to the vocational preparation of students still in secondary schools, area vocational schools, community colleges, and 4-year colleges and universities. These take the form of participation in work-study programs, donations of equipment to be used in training, planned student visits to the business setting, participation by officials in classroom discussions on the world of work, offering local employment opportunities, employment interviewing, and consulting with professional educators (including both counselors and vocational education instructors) with respect to qualifications and expectations for the work forces, especially at the entry level. Contributions such as these have obvious advantages for the organization as well as for the schools.

Finally, business and industrial organizations often cooperate in training programs initiated by labor organizations, such as apprenticeship and government retraining programs.

Apprenticeship as Preparation for Employment

Apprenticeship represents one of the longest established avenues to education for employment outside the structure of formal Education. Basic control of apprenticeship has remained with the labor movement in spite of the existence of such organizations as the Bureau of Apprenticeship and Training in the U.S. Department of Labor. Few educational programs are of more key importance to our economy, and none are in greater need for reorientation.

The apprenticeship system, which is essentially limited to certain of the skilled trades and crafts, emphasizes "learning by doing" supplemented by a certain amount of instructional activity. It places a high premium on the amount of time devoted to a particular learning task as a criterion of successful completion. Equally emphasized is the demonstrated ability of the apprentice to perform his duties increasingly better until those conducting the program judge his level of skill to have reached journeyman status. Training is organized to permit the apprentice to move from level to level, from unskilled helper to the skilled craftsman.

The long history of apprenticeship in the United States and its even longer record of success in other countries clearly indicate that this approach can produce highly skilled craftsmen in certain trades and occupations. Whether some alternative approach to educational preparation would be better is debatable whether this one works is not. It does.

The apprenticeship movement in the United States is currently suffering from several handicaps in its organizational and operational structure. These handicaps will be discussed and some recommendations made for overcoming them.

The first handicap is a general resistance to experimentation with alternative approaches to education as preparation for employment. This is not to say that the system has remained completely rigid and unchanging over the years. Standards for conduct of apprenticeship programs and procedures in moving from apprentice to journeyman have been rigidly defined and, by and large, appear to be equally as rigidly controlled. They are, however, not always rigidly followed, and a great many changes have taken place. However, the apprenticeship movement has not sufficiently used new knowledge regarding educational approaches. Whether these newer approaches would make positive changes in apprenticeship methods is beside the point—no sufficient attempts have been made to learn whether or not this is the case.

The second handicap lies in the inadequate adaptability of the apprentice system to other approaches to education as preparation for employment that have developed over the years. While some apprenticeship programs have accepted formal Education toward meeting partial apprenticeship requirements, these arrangements often seem to be more a token recognition than carefully considered attempts to shorten the length of pure apprenticeship training.

The third handicap has been the failure of the apprenticeship movement to select apprentices strictly on the basis of their probable chances for training and vocational success. Far too often, requirements and/or selection are based on nepotism. The types of discrimination still practiced in certain apprenticeship operations were discarded several years ago as intolerable by most other agencies offering education as preparation for employment.

Finally, a fourth handicap has been the unwillingness of some to increase the number of available apprenticeship positions to conform with the interests of individuals and the needs of society. By purposeful planning, shortages of skilled tradesmen in certain skilled trades have been created and are maintained. The reasons why labor union policymakers have adopted such procedures are obvious. It is equally evident that a concentrated effort should now be made to change these procedures and increase the number of available apprenticeships. That many apprenticeship councils can point to unfilled quotas is more the result of restrictive entry requirements and the ineffectual publicizing of these vacancies than of any lack of interest by people to fill them.

If the apprenticeship movement is unable or unwilling to make these major changes, inevitably this most-important approach to education for employment will eventually be replaced by other educational approaches. Societal needs will not forever remain silent.

Apprentices must also hold the desire to work as a strong personal value, and want to take care of themselves. If their apprenticeship is successful, they either sustain or develop strong interests in their occupation as well as a high degree of personal pride in their skills and the products of these skills. Apprenticeship demands a general education background similar to that of the high school graduate. The current requirement of many apprenticeship councils that applicants possess evidence of high school graduation would seem appropriate.

The Manpower Development and Training Act as Preparation for Employment

The Manpower Development and Training Act of 1962 (MDTA) did not create any new *kinds* of educational opportunities as preparation for employment. It did, however, create a great many *more* opportunities in terms of educational activities directly designed to prepare persons for employment.

The MDTA is Federal legislation designed to increase dramatically both the number of vocational training opportunities and the number of persons enrolled in vocational training. These objectives represent only a means to the ultimate objectives of MDTA; e.g., reduction in unemployment, and an increase in the proportion of the work force engaged in gainful employment. It seeks to accomplish these objectives by offering financial reimbursement to establish institutions, agencies, and organizations conducting vocational training programs, and financial subsidies to the unemployed and underemployed to enable and encourage them to undertake vocational training. There are no provisions in the MDTA for establishing new kinds of educational training institutions.

As originally conceived, the MDTA was seen as having great potential for meeting the vocational training needs of the truly "hard-core" unemployed. If this was ever possible, it is painfully obvious that it has not been realized to any appreciable extent. Perhaps as a result of this failure, there have been marked changes in the MDTA in the form of amendments since its original enactment in March 1962. Some of these revisions will indicate, in part, the current nature of the MDTA. Among them are: (1) Major emphasis on training at the semiskilled-worker level has been shifted to include a range of occupational levels from the basic education necessary to begin any vocational training through graduate work in university settings; (2) a change from a maximum of 40 weeks' training to a maximum of 104 weeks' training; (3) a change from an almost exclusive emphasis on training unemployed adult heads of households to include both unemployed and underemployed workers, regardless of whether they are heads of households; (4) a change in emphasis on youth training, with age limits being extended from 19 to 21 to 16 to 21, and an increase from 5 to 25 percent in the allocation of funds for such training; (5) almost exclusive emphasis on training in public school settings has been shifted to include as well both private schools and on-the-job training; (6) a change from financial subsidies to trainees that were not to exceed what they would receive through unemployment compensation to a base providing subsidies higher than unemployment compensation; and (7) emphasis on confining trainees to classes composed entirely of MDTA trainees has been shifted to allow, in addition, for individual referral to programs training non-MDTA students.

Each of these changes has expanded the intent and scope of the MDTA. With the subsequent passage of other large vocational training measures—notably the Vocational Education Act of 1963 and the Economic Opportunity Act of 1964—we have a situation where the same people who are eligible for participation in the Economic Opportunity Act can participate in the MDTA, and those eligible for participation in MDTA may also participate in the Vocational Education Act. Current competition for students and staff among administrators of these three government-sponsored and financed programs would, were it fully described and documented, make for a most interesting paper. Here, discussion must be limited to questions more directly pertinent to the MDTA, two of the more pressing of which are: (1) What kinds of persons in need of training make the MDTA necessary? and (2) What possible effects can MDTA have on changes in personal values of persons for whom the MDTA is not intended?

With the variety of available types of education as preparation for employment, why should any segment of our labor force not be able to gratify its training needs from among these? Three possible explanations are suggested: (a) MDTA trainees may be uninformed about available educational opportunities; (b) MDTA trainees may be so economically depressed that they are unable to take advantage of educational opportunities on their own; or (c) perhaps they place relatively little value on desire for gainful employment compared with those enrolled in non-MDTA training programs. Of these possible explanations, the third is most likely true.

The claim that the MDTA can be viewed as a means of meeting vocational education needs of those placing relatively little value on a desire for gainful employment is grossly superficial. There is reason to believe that MDTA serves many who have either rejected formal education or who have been rejected by it, although neither situation is likely to exist independently of the other. For example, the youth-training provisions for school dropouts are limited to those who not only have been out of school for a period of 1 year but who, in addition, are described by school authorities as persons unable or unwilling to take advantage of formal Education opportunities, including those made available under the Vocational Education Act of 1963. In this sense, they can be described as placing little value on the desire for gainful employment, for they do not value it highly enough to prepare for it on their own.

Some adults to be served by MDTA also place relatively little personal value on desire for gainful employment, a conclusion drawn from recent amendments to the MDTA which raise training allowances above unemployment compensation allowances. Backers of this amendment proposed these financial incentives as necessary to motivate some to undertake vocational training on the apparent assumption that this would lead them to seek employment utilizing newly acquired vocational skills. Evidence demonstrating the validity of such assumptions is needed.

There is also reason to believe that others to be served by the MDTA have environmental handicaps great enough to prevent them from developing and contributing their maximal skills to our occupational society. They are often found among those described as "underemployed." They have demonstrated a personal value for gainful employment because they *are* employed. They are most apt to be heads of households whose family responsibilities prevent them from resigning current jobs to seek vocational training at a higher skill level. They may not be so "poor" that they are eligible for vocational training under the Economic Opportunity Act, but they are too poor either to take advantage of free public education or pay for education on their own. While training in higher level job skills for such persons obviously will not directly contribute to reducing unemployment in that they are already working, it may contribute directly and substantially to maximal manpower utilization.

The persons described here have in common availability to secure education as preparation for employment on their own. In return for financial subsidies provided under the MDTA, they are asked to give up some of their rights to freedom of choice since the MDTA *selects* enrollees and *assigns* training. This results in a limitation of choice which would theoretically be available were these individuals able to consider other educational opportunities. However, for these people the restricted opportunities offered by the MDTA may be still greater than the real or imagined lack of opportunity that may have existed prior to passage of this act. In any case, the concept of meeting individual needs indirectly by directly attempting to meet societal goals—the exact reverse of formal Education—is clearly illustrated in the Manpower Development and Training Act.

Viewing the MDTA as a means of meeting the educational needs of persons who cannot and/or will not seek education as preparation for employment on their own is of utmost importance since it provides a base for selecting and rejecting trainees. It is hoped that the availability of the MDTA will in no way inhibit or restrict the initiative of those who would seek vocational training on their own if this act did not exist. The financial subsidies for trainees should not become bribes which deter people from taking advantage of training opportunities available in, for example, area vocational schools. If the MDTA leads them to barter some of their freedom of choice in return for a training stipend, in the long run, the best interests of our society would not be served. This problem is too complex to be discussed fully here, but it is also too important to be ignored. It is hoped that raising this possibility may provide additional perspective on ways the MDTA may fit into the total pattern of educational opportunities in our society.

The Economic Opportunity Act as Preparation for Employment

The Economic Opportunity Act (EOA) of 1964 is a major legislative effort to attack the problem of education as preparation for employment faced by those living in the culture of poverty. While the total act is concerned with attacking poverty on a base much broader than education alone, the provisions for education are significant and deserve special discussion here. Of the Act's provisions primarily related to education, the Neighborhood Youth Corps and Work-Study Program are basically designed to help students finance their education. A third, the Job Corps, is an educational enterprise per se, and on this our attention will be centered here.

The three facets of the Job Corps can be described briefly. The first is represented by the rural Job Corps centers. These are residential centers intended to provide certain educational experiences for male youths aged 16 to 21 from the culture of poverty whose educational needs have not been met through formal Education. These centers do not appear to be educational settings offering opportunities leading directly to employment as much as they are places where skills and attitudes can be taught as a prerequisite to acquiring specific job-skill training and employment. Poverty-stricken youths are taught basic concepts of work, and conscientious attempts are made to inculcate a desire to seek gainful employment. In addition, fundamental academic skills of reading, writing, and basic arithmetic are taught, with the hope that graduates will have reached the fourth-grade level by the time they leave. Vocational training consists of very rudimentary job skills applicable to semiskilled and even unskilled levels.

The second facet of the Job Corps is the urban Job Corps centers which, like the rural centers, are residential programs for male poverty stricken youth aged 16 to 21. Enrollees are more ready for employment than those in rural centers, and may even come to urban centers from rural centers; or they may be assigned directly to urban centers. In urban centers, the academic skills of enrollees will hopefully be brought up to about the eighth-grade level. In addition, vocational job skills will be taught at the semiskilled level which supposedly will qualify many for direct entry into the labor market. Some graduates from the urban centers will also go into MDTA training to prepare for occupations requiring still higher levels of job skills. As in the rural centers, concentrated attention is placed on inculcating the desire for employment.

The third facet of the Job Corps is the Women's Job Corps. Other than its being designed for female rather than male enrollees, it is similar in nature and intended function to the urban Job Corps centers.

As with the MDTA, the Job Corps does not represent a new *kind* of education. Rather, it offers special opportunities for those whose educational needs have not been met by formal Education. Therefore, primary emphasis must be focused on enrollees in this program, who can most accurately be described as among those who cannot and/or will not take advantage of opportunities available through formal Education. A discussion of the constellation of causative factors leading to this condition is neither possible in, nor appropriate to, the purposes of this paper. For whatever reasons, these are persons who, without some kind of special Education outside the structure of formal Education, appear to be perpetually susceptible to chronic unemployment and underutilization of talents. They live in a culture where opportunities to work are neither readily available nor highly desirable, and they represent prime candidates for imposing severe lifelong financial and social burdens on the rest of society if they are neglected.

The Economic Opportunity Act is a direct effort to reach those at the very bottom of a long barrel and impose certain middle-class values on them in the hope that they will become productive members of our middle-class society. Thus, it is the clearest available example of an attempt to control and redirect a segment of society in the interest of society as a whole. The help provided those to be served under this Act can be justifiably described as designed to meet their needs only if the assumed unconscious needs as well as the demonstrated conscious needs of such individuals are considered. Without this consideration of unconscious individual needs, the Act appears to be best described as one designed to meet societal needs directly and individual needs incidentally.

Well-designed studies are urgently needed to evaluate the effectiveness of various methods and procedures to be employed by the Job Corps with enrollees from various backgrounds of poverty. The more global features of the Job Corps must also be carefully evaluated in terms of effectiveness in meeting the goals and objectives of the Economic Opportunity Act. Educational motivations and personal values cannot be legislated. If those served by the Job Corps are to acquire the motivations and values deemed desirable by society, at least as much attention should be devoted to evaluating the program's effectiveness as to providing opportunities of unknown and untested worth.

Chapter 5. New Dimensions for Civic Education

The drastic and dramatic changes which have been occurring at a rapidly accelerating rate since the beginning of the 20th century have impinged on all aspects of American life. These changes, which are most dramatic and visible in terms of scientific and technological innovations, have bred an uneasiness resulting from an awareness that they must be integrated with established procedures and existing institutions.

Concern has focused on the impact of these changes on the American tradition of self-government and the development of democratic citizens able to cope with the realities of their own times. Thus to most Americans it is clear that new dimensions in civic education are imperative.

I. FORCES FOR CHANGE IN CIVIC EDUCATION[1]

Changes needed in civic education must be viewed in the light of the following most significant movements characterizing contemporary American society.

The Technological and Scientific Revolutions

Scientific and technological advance is all-pervasive in American culture. It affects our international posture, our folkways and mores, the composition of our population, our intellectual climate, as well as our occupational patterns. Most significantly, it has raised the question of the continued existence of civilization as we know it.

Science and technology have made possible a better life for more people and are solving some of the persistent difficulties of human existence. But they have also created some new and difficult problems. For example, automation introduces greater uniformity, accuracy, and speed into production, and in the long run reduces costs. But automation also can cause economic dislocations and unemployment, and may eventually prove to have less tangible but disturbing effects. So, too, the benefits of the peaceful uses of nuclear energy must be weighed against the annihilative properties of atomic and hydrogen bombs.

Difficult as it is to prepare adequate numbers of scientists and technicians, it is even more difficult to educate citizens capable of maintaining social unity in a period of rapid change. In the words of the social studies committee, "It is the consumers rather than the producers of science whose education for life in a scientific era is dangerously inadequate."

Pressing Population Changes

The staggering increase in world population creates problems in almost every aspect of the human condition, and the unevenness of this growth in various parts of the world merely intensifies them. In economic terms, increasing population demands increased productivity, but in some areas productivity cannot keep abreast of population growth. The greater proportion of older people in more highly developed economies requires that the economy support growing numbers no longer active in the labor force. To provide services for greater numbers of people, taxes increase sharply. Political problems accompany population shifts from rural centers to sprawling urban centers. Serious inequities in legislative representation arise and prove difficult to correct. Stress and strain are created in meeting the American ideal of free public education for all children and our ability is challenged to maintain educational excellence in the face of unprecedented numbers to be educated.

The Changing American Economy

The changes in the American economy since 1900 rival those which have occurred in science and technology. While economic changes are probably less visible and certainly less well understood, they are as pervasive as technological advances. Bigness, complexity, and impersonality characterize our economy, and the average consumer feels less and less able to influence the economic forces which intimately affect him.

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[1] The analysis in this section is drawn largely from a draft report prepared by a commission on the social studies appointed by the National Council for the Social Studies in 1958.

Perhaps the single most significant change has been the increasing role of Government in our economic life which, since the Great Depression, has in considerable measure resulted in the greater stability of the economy. The distinction between the individual as a consumer and a citizen has become less marked, and the need for the citizen to be economically literate has become correspondingly more urgent.

While the American economy has been exceedingly good to most Americans, many continue to be relatively disadvantaged, and economic and other forces tend to alienate them socially, culturally, and politically as well. Assimilating these groups into American social and political life is a basic national problem, and one in which education for citizenship is intimately involved.

Government and the Individual

Just as the economy is marked by bigness, so, too, is government. The impingement of government on the citizen at all levels is an important fact of life. And the problems of government about which the responsible citizen is obliged to be informed constantly grow more numerous and complex. At the same time, some problems are such that governmental action cannot be effective unless a degree of secrecy is maintained. The limits to which this official censorship can and should go become an increasingly thorny problem, for the electorate must be well enough informed in order to select wise public officials who will utilize the advice of experts in formulating policy.

Government expansion has occurred as well in areas other than the economy. Its regulatory functions are being used to help fulfill the aspirations of disadvantaged minority groups, as well as to control currency, tariffs, subsidies, and allocations. The intelligent and responsible sharing of power between levels of government, and between individuals and private agencies and their various governments, is a persistent problem.

If America is to maintain faith in the principle that our Nation derives its just powers from the consent of the governed, then it follows that the good citizen is the educated citizen. As the social studies committee remarked, "Surely democratic government is safer in the hands of a people whose education is adequate for an understanding of the major problems which must be solved if the benefits of science and technology are to be widely shared and the new dangers to human life are to be minimized."

The scientific and technological revolutions, pressing population changes, the changing economy, and the expanding role of government are the forces for change in civic education most relevant to this paper. However, three additional forces play a significant and related role.

International Interdependence

The tide of history and the progress of science and technology have brought about a condition of international interdependence. The contraction of time and space as factors that separated people from each other has implications we do not yet fully understand. Technological developments such as Telstar have within them the seeds of international cooperation or conflict, depending on the use men make of them. Unfortunately for all, man's ability to construct new instruments is outstripping his willingness to use them for peaceful and constructive ends.

This international interdependence has created the need for citizens with widened horizons of loyalty. This is not to say that pride of homeland and culture is obsolete or outmoded, but in addition to nationalism, faith in and loyalty to the concept of a world united in peace is demanded. Unfortunately, the rising tide of nationalism in former colonial territories comes at the very time when international interdependence requires a broader view. Realistic civic education must lead young people and adults to understand the nature of new international relationships and develop leaders capable of providing wise guidance as inevitable stresses and strains in international relations occur.

The Conflict of Values

A concomitant of rapid social, cultural, and scientific change is the collision and competition between accepted values and ideals and new assumptions and premises. Today this is most visible on the international scene in the conflict between the tenets of democracy and communism. Within our country, race relations demonstrate how savage and primitive the conflict among values, assumptions, and beliefs can be.

Young people are particularly insecure at a period when values are questioned and in conflict. They are even more unsure than adults of the foundations upon which their society is based, less devoted to its accepted ideals, and less satisfied with its value assumptions. Certainly a major task of education in general, and civic education in particular, is to help young people think through the fundamental premises on which self-government rests and understand and accept the values of a free and open society.

In an age of technological development characterized by automation, great economic prosperity may be attained, but with less than full employment for some disadvantaged groups. At the same time, rapidly growing numbers of people with rising expectations and of diverse status and background are being concentrated within enormous urban complexes. Our ability to maintain social and political stability and cultural vitality in the face of these forces is a problem of prime importance.

Maintaining a unity strong enough to encompass and contain our diverse ethnic, racial, and economic groups and avoiding social and political alienation among the economically disadvantaged groups will continue to be a basic national problem. Against a leviathan economy and government, the individual seems to count for less and less. Thus, our task is to develop a sense of belonging and identity with our society, particularly among all subgroups in the population. Most importantly of all, we must bring about a commitment to the democratic process on the part of those not already so committed. Civic education, in short, is urgently compelled to seek a new approach to Americanization in the decades ahead.

II. WHAT IS NEEDED?

The foregoing underscores the need for a revitalized, functional, and universal renaissance in education for citizenship in order that all groups in America might identify with our civic culture. Clearly, formal education alone cannot accomplish this, nor can it be delegated as the sole responsibility of any one department or area within existing schools. Nor can anyone, merely by reaching the age of 18 or 21, be considered to have completed this mission.

Nevertheless, the educational structure must assume a major portion of the responsibility, and within this structure, the social studies curriculum has a preeminent responsibility to develop citizens capable of coping with the forces and problems outlined above.

Some Educational Requisites

Space limitations do not permit a treatment of even those educational developments known to be required for viable citizenship. The following, however, appear to be major guidelines:

1. Thoroughgoing reorganization of school programs, particularly in the social studies, is a minimum essential. The educational experiences provided by the schools must focus upon—

> The social and cultural effects and implications of expanding science and technology.
>
> The causes and results of population pressures, realignment of social classes and castes, and the nature of power.
>
> The processes and problems of production and distribution, not only of economic goods and services, but also of cultural products and achievements and of education itself.
>
> The factors which sustain the democratic process, including due process of law, participation in a two-party system, the inevitability and necessity of pressure groups in politics, and the means of democratic decisionmaking.
>
> A fuller understanding of other cultures, the changed nature of interdependent international relationships, and increased study of the conflicts and problems that inevitably arise when varied cultural systems are brought into continuing intimate relationships.
>
> The values and ideals of a free and open society and the importance of common assumptions and accepted values for social and personal adjustment.
>
> The development of the intellectual abilities involved in reflective thinking, problem solving, and decisionmaking as essential to an informed and responsible citizenry.

Some schools have already made notable progress toward implementing these imperatives, but for a vast majority this is not the case. The traditional mechanisms for bringing about curricular change have proved unequal to the magnitude of the task.

2. The concept of continuing education requires a general acceptance which at present it does not have. A much more careful articulation between schooling and adult education is needed. (See ch. 3 for a convincing rationale of continuing education as an ongoing and never-ending process.)

3. The potentialities of individual students need greater attention. Greatly expanded counseling services beginning in elementary school, continuing through high school, post-high school and higher education, and extending into adult education, are prime components of revitalized civic education.

4. As a highly technological and automated society develops, the number of hours when the individual is not engaged in his work or profession will increase and lead, at least temporarily, to enforced idleness. While society must continue to stress the importance of work, new avenues of personal satisfaction must be provided to encourage young people and adults to make good use of leisure hours. Educational institutions must emphasize handicrafts, the fine and practical arts, individual sports, and various forms of recreation as avenues of self-development.

5. Finally, the new and largely untried educational developments suggested above will require evaluation and measurement if errors are to be rectified and fruitless efforts redirected. More reliable instruments for measuring and appraising some of the less tangible outcomes of effective civic education must be developed.

III. SOME MECHANISMS FOR CHANGE

The forces making for change in education for citizenship are not new, and both professional educators and laymen have in the past put forward proposals not unlike those suggested above. Such proposals have had little national impact on educational organization and classroom instruction. From one point of view, the most pressing educational need is to find mechanisms to expedite change and close the gap between what needs to be done and what is being done. In the absence of clear and guaranteed solutions, our only recourse is to experiment with promising proposals.

There is a crucial need for a national body, composed of eminent social scientists, historians, and educators specially competent in social studies education, to give full-time and continuous study to the new dimensions of civic education.

Such a body would not have as its mission the formulation of a standardized and uniform national curriculum. Indeed, special precautions would be necessary to insure that its proposals and recommendations would not be mandatory, either implicitly or explicitly.

Its task would be to reexamine and clarify the role of the social sciences in the school curriculum and develop a structural framework appropriate to a dynamic society. Its mission would be threefold: (1) The development of a rationale for the selection of content essential to civic education; (2) scholarly study of the new content developed in history and the social and behavioral sciences to determine that subject matter which warrants inclusion in the program of studies; and (3) the study and use of insights furnished by the psychology of learning, child development, and other behavioral sciences to insure wise grade placement of content and intelligent mobilization of teaching methods.

Such a national body must attract the most competent scholars, laymen, and educators, and should, perhaps, be nongovernmental to avoid any suggestion of governmental control. If it is constituted as a Federal agency, it must be protected against undue influence and insured a high degree of independence and autonomy. Whether a Federal agency or an independent national body, it must exert no legal control over any local or State educational instrumentality.

To initiate action, an ad hoc conference of scholars and educators should thoroughly debate the desirability and feasibility of the proposal made by Prof. Paul R. Hanna of Stanford University for a national commission for curriculum research and development. In brief, Hanna proposes the establishment of a "permanent national commission on curriculum, nongovernmental, widely representative, and continuously at work on educational goals and balanced curriculum design," with membership to be drawn from three segments of our national life: scholars, laymen, and schoolmen.

Hanna suggests in considerable detail what the national commission would do, its possible relationship with other national efforts in curriculum, the authority it would have, how its members might be selected, and the anticipated results of its work.

While the national body proposed here would not be identical in all respects with the national commission envisaged by Professor Hanna, his proposal would provide a concrete point of departure for debate and study.

A network of State or regional centers for the development of curriculum and instructional materials, as well as for upgrading of inservice teacher education is an urgent necessity.

The suggested national body could not and should not be expected to bring about nationwide reorganization of educational programs. It must be supplemented by continuous, full-time State or regional centers which would carry out the difficult, time-consuming, and specialized task of translating into programs the ideas, goals, rationale, and selected subject matter developed by the national body. The social studies committee commented:

> The overall picture of the social studies curriculum, after three decades of reliance on local curriculum planning, reveals progress toward a sound program in some school systems, makeshift adaptations in others, and the survival of a curriculum of World War I vintage in a majority of the schools of the Nation. This result does not suggest that local curriculum planning should be discontinued, but rather, that its proper role should be more clearly identified . . . . Local efforts in planning the social studies curriculum need the direction of a study at the national level—a study which would bring scattered structural elements into an harmonious unity.

Some preliminary attempts in this direction have been made under the guidance of the U.S. Office of Education, but centers established to date do not entirely serve the same functions envisioned for those proposed here. Furthermore, thorough discussion is needed on whether the impetus and support of these centers should come primarily from the Federal Government, or if State and local educational agencies should play the dominant role. The proposed Interstate Compact on Education (see ch. 8) could conceivably be a vehicle for the development of such centers.

This is not the appropriate place for a detailed blueprint of these centers. But however they are organized, they must be continuous, associated with institutions of higher education capable of furnishing scholarly resources, staffed by the most competent classroom teachers available, and generously supported.

Approaches to curriculum development that were appropriate in years past are no longer adequate today. The leadership provided by a top-level national body, combined with the scholarly resources and special competencies of dedicated professionals available in the States and locally, promises a new mechanism to lead to the civic education required.

The course of history demands that we take stock of our educational responsibilities. If we are to maintain social and political stability, reduce and eliminate the alienation of some groups from our body politic, and maintain, in the face of powerful counterforces, the personal commitment of Americans to a free and open society and democratic processes, it is necessary that new goals and directions for civic education be charted.

Somewhat radical shifts in the attitudes and behavior of most Americans will be required and positive action will be demanded in the form of new procedures and mechanisms to effectuate change. In turn, these departures will require substantial increases in educational expenditures.

Although the cost will be high, the problems complex and difficult, and the outcome unforeseeable, it is reasonable to believe that the harvest of our efforts would be bountiful. The pattern of cooperation for the development of better civic education is visible; the architects are available; the job is feasible. It must be undertaken now.

Chapter 6. Compensatory Education for Culturally Disadvantaged Children

I. AN OVERVIEW

Clearly the Nation's children are growing and living in a world of complex and rapidly changing technology and automation within an economic and social system that demands increasingly higher levels of general educational and vocational development. Economic conditions may also dictate that skills be changed throughout the course of their adult lives, and today's youngster must be prepared for this if his full talents and abilities are to be used. Educational attainment, one of the primary determinants of economic and social opportunity, status, and productivity, is the foundation.

Existing educational programs are relatively well suited to present and future needs of a large proportion of our school-age population. Perhaps one-half to two-thirds of the youngsters entering kindergarten or first grade are able, all other things being equal, to complete their educational programs through secondary school. However, for many additional millions of children, other things are not equal from the time they enter school to the time they leave—often before completing the high school program. The focus here is on the latter group who have been variously labeled as culturally deprived, culturally disadvantaged, or educationally disadvantaged.

Within the present educational framework there are several million youngsters who do not progress normally in terms of their educational development. Perhaps more than one-third who enter high school do not graduate. A great many of them are at a distinct disadvantage because of their home backgrounds, values, goals, and motivations. In most cases their deficiencies originate within their homes and environmental backgrounds, which do not prepare them for the learning and behavior required in the schools and by American society in general.

The backgrounds of these educationally disadvantaged youngsters are most often characterized by poverty, typified by large families with unemployed or unskilled parents having minimal levels of education. Most of these children live in urban slums, although a sizable number are found in smaller communities and depressed rural areas. Most are white. But a considerable number are members of racial minorities, and for them the oppression of poverty is aggravated by discrimination. However, cultural and educational deprivation cannot be equated with race or ethnic membership.

The relationship among American education, economic progress, and the educationally disadvantaged can be stated most simply by reviewing the current situation. The United States is "a rapidly developing, complex, urban, industrial society which requires that the functioning members of this society be highly literate, responsive to rapid changes in every area of life and work, and able to learn and relearn complex ideas and skills as minimal conditions for economic security, social maturity, and independence."[1] However, our educational system has not been notably successful in preparing the educationally disadvantaged child for such social and economic productivity and security. From both the economic and humanitarian points of view this is particularly tragic and deplorable, since many of these problems are soluble with means at hand.

One approach to the problem is "compensatory education," or special educational programs for disadvantaged youngsters which emphasize prevention and "compensation" for the educational and psychological handicaps resulting from earlier environmental deficiencies. With the object of providing full educational opportunity, compensatory educational programs are designed to give youngsters the opportunities and experiences necessary for the fullest development of their potential.

President Lyndon B. Johnson stated that "we must demand that our schools increase not only the quantity but the quality of America's education." Certainly the evidence is abundant that for the educationally disadvantaged child "only high quality education can break the ancient cycle of poor schools, poor job preparation, poor pay (or unemployment), and poor people."[2]

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[1] B. Bloom, D. Allison, and R. Hess, *Compensatory Education for Cultural Deprivation* (New York: Holt, Rinehart & Winston, Inc., 1965).

The Magnitude of the Problem

A brief review of a few historical facts provided by the U.S. Office of Education will help place the magnitude of these problems in perspective.

The correlation between cultural deprivation and poor education and poor economic and social productivity cannot be questioned. "Less than half of U.S. employers will consider hiring a high school dropout. Furthermore, the dropout, if hired, is the first to be fired, is the lowest paid and has the least chance for advancement. Roughly 18 percent of our unskilled workers are now unemployed—80 percent of those now unemployed did not finish high school."[3] Thus, those who do not complete high school enter a work world which has fewer and fewer places for them. Despite these facts we are confronted with an educational situation in which—

- Almost a million youngsters will continue to drop out of school each year if present rates continue;
- At the current rate 1 student out of every 3 in the fifth grade drops out before finishing high school; in the high schools of many of the large urban areas, as many as 60 percent of the youngsters who enroll in the 10th grade do not continue through graduation; and
- One-third of the 3,700,000 youngsters enrolled in the Nation's 15 largest school systems need special education help.

The vast majority of the children cited in these figures are accurately classified as culturally and educationally disadvantaged.

II. A SUBCULTURAL BACKGROUND: POVERTY AND DISCRIMINATION

To understand the problems presented by the disadvantaged youngster one must start with the fact that he is, almost without exception, the product of one of the diverse subcultural groups within our Nation. His subcultural environmental background reflects the fairly distinct ways of life of a particular socioeconomic, ethnic, religious, or geographical group within the general population.

These subcultural groups vary widely in the degree to which they prepare children to adjust successfully to the prevailing cultural patterns and demands of society at large. The success of the youngsters in adapting to a dominant cultural pattern depends in part on the similarity between that pattern and their own subcultural backgrounds. If the differences are great, and they often are, the youngster is placed at a "disadvantage" in any context which assumes a common or typical background of experience; e.g., the school. Success in the schools has traditionally required a fairly "middle class" orientation in terms of values and behavior patterns which are alien to the experiences of many underprivileged children.

The disadvantaged youngster's educational and cultural handicaps are primarily the result of the disparities, or incongruities, between his subcultural background and the prevailing culture of the schools and society in general. *The main point is that the causes of their disadvantages are social and economic in origin.* Since these differences in behavior and motivation in the educational setting result from learning and experience they are subject to change under the proper conditions. Modifications can be made through new experiences and learning such as that provided through special compensatory educational programs.

Common Misconceptions

Before the characteristics of the disadvantaged child are reviewed, two current and misleading stereotypes concerning this youngster and his family warrant attention. Both stereotypes are reflected in a recent statement attributed to a nationally prominent political leader: "Most people who have no skill have no education for the same reason—low intelligence or low ambition." In the case of most disadvantaged children this perception is grossly false and obstructs recognition of the need for effective steps to remedy the problem.

It is rather commonly assumed that most disadvantaged children have a less-than-average native intellectual endowment, an inference based on their obvious difficulty in meeting the demands of the regular academic program and on the basis of low performance on standardized intelligence tests. While these facts cannot be denied, it cannot be emphasized too strongly that neither condition necessarily relates to genetic endowment in the majority of cases. The psychological evidence is overwhelming: not heredity, but environment has the damaging effect on the child's development and overall performance. Thus, the same patterns of behavior, motivations, and values that affect his academic performance also affect his intelligence test performance. In both cases the result is a lowering of the level of functioning to below what he would be capable of under more favorable conditions of stimulation and incentive. We have abundant, often dramatic, evidence of improvement in both educational achievement and measured intelligence when disadvantaged children have been provided with compensatory educational programs.

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[2] A. Shostak and W. Gomberg, *New Perspectives on Poverty* (Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1965).

[3] W. Buckingham, "The Impending Educational Revolution" in L. Evans and G. Arnstein (edit.), *Automation and the Challenge to Education: Symposium on the Educational Implications of Automation.* (The National Education Association, 1962).

The second common misconception derives from assumptions concerning the disadvantaged youngster's parents and family background which hold that they have no ambition either for themselves or their children, and are basically uninterested in the educational progress and welfare of the youngsters. For a *very small minority* this may be true, but in most families this stereotype is grossly false and unjust. Robert Weaver has stated this point very effectively in describing the homes and families producing many of our culturally disadvantaged children:

> Slums in American cities today house families which hold a wide range of values and evidence a wide variety of behavior patterns. Some are households with female heads and are stable nonetheless; others may be ungrammatical but adhere to high moral standards; still others evidence all the attributes of middle-class behavior and are dedicated to its values, if not recipients of its rewards. All three groups have ambition and talent, but fight an uphill battle in maintaining respectability and achievement for themselves and their children. . . .[4]

While the environments, experiences, and child-rearing practices characteristic of the homes of disadvantaged children are recognized to be detrimental to the child's overall development and educational attainment, this is *definitely not* a result of the parents' willful neglect or lack of interest in most cases. In fact, quite the opposite is true. The parents of disadvantaged children harbor hopes and aspirations for the happiness and prosperity of their children common to parents of all socioeconomic strata. However, in helping their youngsters to grow and develop they lack the economic and social resources, the knowledge and guidance, available to parents in more privileged circumstances.

The strong interest of parents of disadvantaged children in the educational progress of their children has been documented many times. Sears, Maccoby, and Levin compared the attitudes and child-rearing practices of parents of middle and lower socioeconomic status.[5] They found that the lower income parents were actually more interested and concerned that their children do well in elementary school than were the middle-class parents. As the investigators pointed out, this finding may in part reflect the fact that the deprived youngsters were doing less well educationally than the more privileged youngsters and were therefore causing more concern. Nevertheless, the lower income parents were not "uninterested" in the childrens' progress.

Riessman found that parents of disadvantaged children place a great deal of importance on the education of their children.[6]

> Interviewees were asked the question, "What do you miss most in life that you would like your children to have?" Over 50 percent of the white lower socioeconomic group (and 70 percent of the Negro group) said "education." Even more significant is the fact that the respondents supplied the word "education"; they did not select from a list of possible choices provided by the interviewer. This would seem to mean that education, at some level, not only is important to this group, but is also in the forefront of their minds.

The hopes of these parents are necessarily tempered by economic reality. In countless cases the parents' resources are exhausted in providing minimal, often substandard, food, clothing, and shelter for their families.

The stereotyped conception of the parent of the disadvantaged child as being basically uninterested in the child's welfare imposes strangling limits on our programs to aid these children and their families. This denigrating view can result in an unwillingness to work with parents in improving the youngster's environment and stimulating his full development. Yet, without this active involvement of the parents, the changes one can hope for in the child are seriously curtailed from a long-term point of view.

Again the research evidence and experience of a great many investigators contradicts popular opinion. The parents of disadvantaged children when approached in a nonjudgmental and nonthreatening manner, can show surprisingly rapid improvements in their child-rearing practices.

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[4] Robert Weaver, "Human Values and Urban Life," *Proceedings of the Academy of Political Science*, May 1960, pp. 33–34.

[5] R. Sears, E. Maccoby, and H. Levin, *Patterns of Child Rearing*, (Evanston, Ill.: Row, Peterson and Co., 1957).

[6] F. Riessman, *The Culturally Deprived Child* (New York: Harper & Row Co., 1962).

III. THE CHARACTERISTICS OF THE DISADVANTAGED CHILD: A COMPOSITE PICTURE

Before moving to a more detailed description of the disadvantaged youngster a word of caution is necessary. Despite our emphasis on differences, the underprivileged youngster is obviously more like than unlike other children in all basic drives that direct human behavior. He is motivated by the same needs for love and affection, respect and approval, belonging and achievement as the youngster from more privileged circumstances. However, he has necessarily—as a result of his experience—learned to satisfy these needs in different ways. Further, any attempt to present a composite or an "average" must obscure many of the differences between the individuals involved. In reality the range of individual differences within the group of disadvantaged youngsters is as wide as that found in any other group of children.

Health and Physical Status

The facts of the health and physical status of disadvantaged children are clear. When compared with children from more favorable economic and social backgrounds, underprivileged children show a higher incidence of health problems closely associated with both the conditions under which they live and a lack of adequate medical care. For example, they have been found to have higher percentages of sensory defects, such as impaired hearing and vision. Many of these defects, which could be corrected with medical attention, go undetected or untreated. The possible effects of such conditions on the youngsters' educational performance are obvious.

Numerous other health problems which beset the disadvantaged group vary from those related to poor diets, varying degrees of malnutrition and a lack of adequate rest and exercise, to the high incidence of parasitic infections and diseases supported by unsanitary and overcrowded living conditions.

These health problems can affect the child's school performance in countless ways. Certainly the youngster who is ill fed, ill clothed, or lacking in normal strength and vitality cannot be expected to direct his energies and attention to the problems of learning in the classroom. The attractions offered by the prospects of learning how to read or how to operate an electric drill are slight indeed for the child or adolescent who devotes much of his energy to anticipating lunch because he has had no breakfast, or who has very little energy left to spend after a restless night in a bed crammed with three or four brothers and sisters.

It must be noted that providing for the health needs of disadvantaged children does not at all insure that they will improve their levels of educational performance. It simply represents another forward step taken to make the child "available" for teaching and learning.

Home Environment

The aspects of the child's home environment or particular concern for our purposes are related to (a) the relationship between the youngster and his parents, and (b) the quality and quantity of experiences and stimulation that influence his later development. In most cases disadvantaged children spend less time in activities with their parents or other adults than do middle-class children. Thus, a great deal less attention is devoted by the parents to explanation and encouraging learning, or to providing experiences which will help the youngster develop a wide range of interests and expand his vocabulary and language abilities. Again this situation is not usually a function of the parents' lack of interest; rather it is a result of lack of knowledge, skills, or the means to supply the child with the stimulation that will prepare him for success in school.

For instance, one frequently finds that the child's physical or geographical environment has been quite seriously limited in that he rarely travels beyond his home and immediate neighborhood. This not only restricts his stimulation but it further limits his social experience. The entire situation may reflect the basic social isolation of his family in the community and the fact that unless they happen to have relatives nearby, their social contacts are provided largely by other members of the immediate family. The result is a youngster who is very poorly prepared to cope with experiences and situations outside the confines of his home such as the school experience.

Other characteristics of the home could be cited such as the lack of toys, books, etc., which help the child to learn and develop an interest in learning. The overcrowded and noisy conditions which are common are not only unpleasant but may actually lead the child to develop an ability to "shut out" the people and events around him—a skill diametrically opposed to the kind of "attention span" needed for success in the school setting where he is potentially in a position to learn from the teacher, the other children, and the activities surrounding him.

In view of these conditions the importance of the preschool years to the child's development cannot be overemphasized. If intervention is to attain maximum results, it must begin during these formative preschool years. The objective of eliminating the disparity between the disadvantaged child's experiences and the demands of school and society is attained better by the prevention of problems during the formative years before they have become fully established than by a first aid program after a crisis has occurred in later childhood and adolescence.

Intelligence, Learning Ability, and Language

The measured intelligence of disadvantaged children has been found, on the average, to be lower than that of youngsters from more adequate environments. However, it is clear that this is partly attributable to the negative effects of the child's experience on his intellectual development. The intellectual levels of deprived children vary greatly with the type of environment provided for them. The evidence supporting this fact is conclusive and often dramatic. Again the crucial importance of the preschool period in relation to the development of intelligence is underscored.

Many studies could be cited. For instance, Bloom compared the long-term effects of living in a "culturally abundant" environment to living in a "culturally deprived" environment and concluded that the difference could amount to an average of 20 IQ points over a period of years.[7] Insofar as the timing of this effect is concerned, Bloom suggests that the child's environment from birth to 4 years can result in a difference of approximately 10 IQ points; from 4 to 8 years, 6 IQ points; and 8 to 17 years, 4 IQ points.

Other studies have yielded similar evidence showing that the levels of measured intelligence of disadvantaged children can be changed. In general, they also support the conclusion that intervention at the preschool level results in greater change than intervention at some later point in the child's development.

There is a particularly close relationship between the youngster's intellectual abilities, academic performance, and his level of language development. The importance of language development lies in the fact that language forms much of the basis for thought and communication, and is obviously central to most of the learning tasks presented in the school setting. Research findings pointing to the deficiencies of educationally disadvantaged children with respect to language and speech development aid in understanding why these youngsters perform at a lower level on any task demanding language ability, whether the task is an intelligence test or a reading lesson.

Language and speech are certainly the learned products of experience. The depressed level of development of disadvantaged children is a direct result of their deprived and nonstimulating backgrounds. In their homes language use is limited, and when verbal communications are used they are more likely to be ungrammatical, restricted in content, and brief. The result is that the child is definitely handicapped in educational development, not only because of his own deficiencies in communication, but also because he is, to a degree, unfamiliar with the language and speech used by others, such as his teachers. Restriction in stimulation and experience combine with these deficiencies in language to depress the child's intellectual and educational development.

Attitudes and Motivation

The motivational patterns of disadvantaged children are frequently not conducive to achievement and adjustment as defined in the schools and by society in general. Research in this area highlighting many of the differences between the motivational systems of these children and those of children from more fortunate circumstances has underscored the fact that these differences are a result of learning and experience. The following brief review will show that many of the attitudes and motives of disadvantaged children place them in a particularly difficult and vulnerable position when they enter the school setting.

Success in school demands persistence, continued patience, and confidence in the promise that attendance and learning will be rewarded at some future time by better opportunity, greater income, etc. This is particularly true at the high school and college level when attendance is no longer legally required and the adolescent is surrounded by many activities and attractions other than those offered by the school.

Such persistence and patience is based upon the child's confidence in the future. But the typical disadvantaged child has very little cause for confidence in the security or predictability of the future. Instead, he has learned that the supply of almost anything is limited today and perhaps even more doubtful tomorrow. It is better to satisfy his needs and impulses now, to "grab while the grabbing is good." The concepts of working hard today for tomorrow's rewards, of saving and being patient, have received very little reinforcement in the experiences of the disadvantaged child. This orientation toward the immediate and the concrete is common among disadvantaged children and handicaps them in the school setting.

McCandless has pointed out other ways in which the experiences of underprivileged children place them in conflict with the expectations of the school.[8]

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[7] B. Bloom, *Stability and Change in Human Characteristics* (New York: Wiley and Sons, 1964).

> The lower-class child has little reason to believe that hard work and self-discipline result in success. Middle-class fathers do not put in 8 hours of brutal labor swinging a pick. Such labor is hard; it is done in the heat and the cold; it is dirty; and it obtains relatively few of the world's goods. Nor is the unskilled and uneducated father likely to win conspicuous advancement by his diligence. He remains a day laborer—secure, indeed, from being fired as long as times are good; but at the mercy of his boss, the times, and the weather. He does not get ahead. All he has to look forward to is more of the same. The relatively well-educated and well-trained middle-class father, on the other hand, can, given any breaks at all, demonstrate clearly to his child the advantages of diligence, night work, thinking about the job over the weekend, and so on. He gets a raise; he achieves a promotion; his self-esteem and his family's economic well-being are enhanced.

In these, and in many other ways, the deprived youngster enters school equipped by his experience with a set of motives and values which place him at a distinct psychological disadvantage in the educational setting where the expectations are clearly different from his own.

Educational Attainment

The disadvantaged child enters school inadequately prepared in experience, language development, motivations, and attitudes. It is not surprising that his progress is characterized by progressively greater underachievement as he moves through the grades and falls further and further behind other youngsters. We have evidence indicating that by the time disadvantaged youngsters reach the eighth grade, often after having been retained in the earlier grades, they are 2 to 3 years behind in almost all basic subject areas. The statistics cited earlier in this paper indicate that the consequence of this educational retardation and failure is often dropping out of school, which leads to further constriction of opportunity in the vocational and economic area.

The common patterns of failure and underachievement among disadvantaged children reflect not only the characteristics of the children but the inadequacies of the schools in providing for these youngsters. The implementation of compensatory educational programs to meet these problems will require some extensive changes in our American educational system.

IV. CURRENT STATUS OF COMPENSATORY EDUCATION

Within the past few years a number of compensatory educational programs have been developed on an experimental basis. Research and demonstration projects are being attempted at the preschool, elementary, junior high, high school, and college levels. The preliminary results from many of these programs are encouraging in that the experiences and curriculums provided for the youngsters appear to be able to compensate for some of their environmental deficits. Many of these projects are reporting marked increases in measured intelligence, social adjustment, and educational attainment.

The results from programs at the preschool and elementary age levels are particularly promising. It is hoped that early intervention will make a significant difference in the youngster's educational performance throughout the course of his school career. Data on the subsequent effects, e.g., the permanency of benefits from early intervention, are not yet available since most of these projects have been in operation only a short time.

The results of programs provided for junior high and high school age youngsters are also encouraging. However, as we might expect, more intensive efforts must be made in the case of older youngsters and adolescents because of their cumulative deficits and educational failures.

The wide diversity among the programs currently in operation precludes a detailed summary of these activities. Diversity prevails in every aspect of these projects—they may be sponsored by the community schools, a local welfare agency, a local service club, or a State or national welfare agency; the staffing practices are highly variable both with regard to training and competence and the disciplines represented, e.g., teachers, psychologists, social workers, nurses, and so on; the teacher-child ratio ranges from 1 or 2 teachers for 30 children, to 6 or 8 teachers for over 200 youngsters.

A recent survey of existing preschool compensatory educational programs revealed that projects were in operation at this level in approximately 70 cities.[9] This number does not include those programs associated with Project Head Start. Most of these programs are of very recent origin, having been started in the past 1 or 2 years.

More than 100 community school systems have developed, or are now developing, compensatory educational programs at the elementary and secondary school levels. Some of these have only limited programs affecting a small number of children, while many of the larger urban systems have extensive programs for thousands of youngsters. California and New York are planning programs of compensatory education on a statewide basis through the cooperation of State and local school officials.

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[8] B. McCandless, *Children and Adolescents* (New York: Holt, Rinehart and Winston, Inc., 1961).

[9] Robert Hess, *Inventory of Compensatory Education Programs*, (University of Chicago, School of Education, Mimeo., 1965).

Several urban programs deserve special mention. The Higher Horizons program in New York City has attracted a great deal of attention since it started in 1956. This project has demonstrated that children from deprived backgrounds can successfully adapt and learn in a school setting appropriately modified to meet their needs. Improved educational attainment and social adjustment, increases in measured intelligence, and a decreased dropout rate are evidence of the success of the Higher Horizons project.

Programs similar to the Higher Horizons project have been developed in a number of major U.S. cities. In particular, the "Great Cities Improvement Project," sponsored in large part by the Ford Foundation, has resulted in the development of compensatory programs in Baltimore, Buffalo, Boston, Chicago, Cleveland, Detroit, Los Angeles, Milwaukee, Philadelphia, Pittsburgh, San Francisco, St. Louis, and Washington.

The programs have used a variety of approaches to the youngsters involved. As yet, only limited data on the effectiveness of the various practices are available. Among these practices are: Nursery school and preschool programs; special tutoring and remedial programs after school and during the summer; vocational training and work-study programs; special programs directly oriented toward the potential dropout population; modified curriculums, programed instruction, team teaching, special instrutional materials, and textbooks; increased use of special counseling, psychological and health services; programs intended to enlist the involvement of parents and of community agencies; and special institutes and training programs for school personnel.

One must guard against the impression that these model and demonstration programs, limited as they are to relatively few urban areas, have made a sizable contribution toward solving the problems of the population of disadvantaged youngsters. This is far from being the case. The existing community school programs are serving only a very small proportion of the youngsters in need of compensatory services. Further, developments in the field have been almost entirely confined to large urban slum areas, while very slight attention has been paid to the needs of underprivileged children in smaller cities and in rural areas.

Data collected by the Yeshiva University Information Retrieval Center on the Disadvantaged indicates that over 200 colleges and universities are attempting to develop compensatory educational programs.[10] These programs vary widely in the scope and number of students involved. Most are still in the embryonic stage of development. The practices may involve modified admission criteria and special financial aid measures; special recruiting measures oriented toward the disadvantaged student; special tutoring, remedial and guidance programs during the regular academic year and the summer; modifications of the normal curriculum giving careful consideration to such things as course sequencing; longer periods for the completion of degree requirements; and no-credit courses related to study skills, reading ability, etc. The prospects offered by such college projects are very promising.

Certainly the largest and best publicized effort in compensatory education has been the Head Start Program, conducted during the summer of 1965 as a facet of the antipoverty program. This project, administered by the Office of Economic Opportunity, was designed to help prepare disadvantaged youngsters for entry into kindergarten and was so successful that it has been put on a year-round basis. The Federal Government paid 90 percent of the cost of the program and presumably will continue to do so. While it is too early to assess the effectiveness of the program on the lives and educational development of the youngsters who participated in Head Start, the project has received the enthusiastic support of most all concerned.

Within the last 3 to 4 years the Federal Government has given greatly increased support to health, education, and welfare programs which have had a visible effect on the status of disadvantaged and other handicapped children. The following legislative acts give evidence of the depth of Federal concern:

P.L. 88–156	Maternal and Child Health and Mental Retardation Planning Amendments of 1963.
P.L. 88–164	Mental Health Facilities and Community Mental Health Construction Act of 1963.
P.L. 88–210	Vocational Education Act of 1963.
P.L. 88–214	Manpower Development and Training Amendments of 1963.
P.L. 88–452	Economic Opportunity Act of 1964.
P.L. 89–10	Elementary and Secondary Education Act of 1965.
P.L. 89–97	Social Security Amendments of 1965: Title II, Part 1.
P.L. 89–105	Mental Retardation Facilities and Community Mental Health Centers Construction Act Amendments of 1965.

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[10] *The Education of Socially Disadvantaged Children and Youth: A Brief Introduction and Bibliography* (New York: Yeshiva University, Graduate School of Education, 1965) (Mimeo.)

V. SUMMARY AND RECOMMENDATIONS

Millions of children are fighting a losing battle to grow and learn under handicaps that could be prevented. This longstanding and totally deplorable situation surely cannot be allowed to continue. If any significant change is to occur, it must involve the efforts of all of the health, education, and welfare agencies and institutions that have responsibilities for disadvantaged children. The role of the school is crucial.

It is obvious that our schools and the American educational system must reevaluate current policies and practices in the case of the disadvantaged. With relatively few exceptions, the schools are not meeting the needs of these youngsters. By failing to do so, they are also failing to meet the economic and social needs of the Nation.

There are many reasons for this deficiency in our educational system. The most important of all relates to the lack of investment in, and support for, the schools and school personnel as they attempt to cope with the problems of the disadvantaged. Providing for these youngsters is expensive in time, effort, and money. This support involves more than providing a day-to-day educational program—if this were all that was required, the problem would be considerably less difficult. However, beyond the measures designed to meet today's crisis, we must be willing to support a massive attack through research and special training programs to prepare teachers, administrators, psychologists, counselors, social workers, health personnel, and others to work with the disadvantaged. The need for human talent and ability is as great as the need for more adequate financial resources.

1. *Every step must be taken to insure that the child's physical needs for adequate food, clothing, and medical care are met.*

Provisions guaranteeing that each youngster is provided with these minimum essentials for healthy physical development must be arranged before his educational and psychological development can be considered. If such minimal needs cannot be met by the home, then the school and community agencies must assume the responsibility.

2. *Schools must extend the lower age limits of their programs downward in order to provide preschools for disadvantaged children on a year-round basis.*

Ideally, preschool programs should be made available to underprivileged children at the age of 3 years. The experiences and curriculum provided at the preschool level must be carefully focused to counteract the negative effects of earlier experiences and to prevent future difficulties.

3. *Compensatory programs must not be limited to the preschool and elementary levels but must be implemented at the junior high, high school, and college levels.*

Planning for youngsters of different age levels must insure the continuity of high quality programs from one grade to the next. The one-shot "crash" programs with little provision for systematic follow-through are of questionable value from a long-term point of view.

4. *While a judicious balance between general education and vocational training must be maintained, the disadvantaged adolescent who is not college-bound should be allowed to begin a program of vocational training as early as the junior high school level.*

Guidance and vocational education programs must begin earlier. Currently, many disadvantaged youngsters drop out before such programs are made available to them. For the student who is not preparing for college study, the vocational and economic advantages of remaining in school must be *concretely* demonstrated early in his school career. The counsel and cooperation of the industrial and labor community are essential in order to insure success and continuity in the gradual transition from basic training in the school to placement on the job.

5. *Compensatory programs which are primarily focused on the youngster's educational and psychological development should be centered in the schools.*

The school has been, and will remain, the only agency within the community which has sufficient long-term contact with *all* children necessary to exert a significant and lasting effect on their lives. While this recommendation appears obvious, it is particularly important in view of some recent suggestions which would place the control of compensatory educational programs in the hands of community and State agencies other than the schools. This would be a serious error. While effective programs demand maximum interagency cooperation, the responsibility for tax-supported educational programs must remain the responsibility of the community school system if essential continuity in objectives and practice is to be maintained.

6. *High priority must be given to developing arrangements for interagency participation and cooperation in providing compensatory programs.*

A serious problem that must be solved in developing a comprehensive program relates to the need for coordinating the services offered to the child and his family by various community agencies. Lack of continuity, communications, and follow-through are often seen in the form of overlapping and needless duplicating of services by various agencies. An even more common and serious problem occurs when residence, schools, and other circumstances are changed and services provided previously are not continued because appropriate referrals and information do not follow the child from place to place.

The development of information centers to collect and disseminate information to appropriate agencies concerned with the youngster's case should be given detailed consideration. A model for this effort is provided by the University of Iowa Educational Information Center.

Chapter 7. The Psychology of Learning and a Science of Education

Attempts to develop a body of knowledge about learning that can contribute to a science of education have tended to follow one of two general approaches. The most widely used approach in education has been the methods study which is concerned with determining the effectiveness of a given method of instruction or the relative effectiveness of two or more methods. The second might be called the behavioral science approach. Instead of testing specific methods, the object of research is to determine general principles of behavior which have wide applicability in many educational settings. Each approach has its own peculiar strengths and weaknesses.

Research in methodology did not get much of a start until the late 1800's. Although it was not the first, the work of Joseph Rice might be cited as an example of early attempts to develop a science of teaching based on methods research. Rice expressed his views of educational methodology in these words: "We have opinions innumerable, but no facts at hand in support of our opinions. Educators are divided into creeds; and while the members of the same creed are frequently in harmony with one another and sometimes form a mutual admiration society, there are few points on which the different creeds themselves agree." (*Rice*, 1913, p. 1.)

A man of action as well as words, Rice set out on an ambitious program of research to replace opinions with facts. The results of his research were published over a period of years in *The Forum* and in a book called *Scientific Management in Education*, which was a collection of articles that had appeared in *The Forum*. This book contains chapters with titles such as: "Success and Failure in Arithmetic," "A Test in Arithmetic," "Futility of the Spelling Guide," "A New Basis in Supervision," and "The Results of a Test in Language."

Although Rice had little direct impact on educational practice, he did pioneer a type of research that has added considerably to the literature of education. Although this methods research has not revolutionized education at any time, it has had a consistent positive systematic effect.

The primary advantage of carefully done methods study is that it can provide some immediate guidelines to practice, and for that reason is absolutely essential at this stage in the development of education. It does, however, have some very serious limitations.

The most serious of these is the degree to which the results of methods studies can be applied generally to students other than those directly involved in the research. The primary purpose of research is not only to determine the effect of the conditions imposed on the students involved in the research but to be able to make generalizations which are valid to other students as well. A number of conditions frequently prevail in methods research which make such generalizations extremely hazardous. Suppose, for instance, a certain study shows that students taught by television did as well on a certain unit of instruction as did those taught by their regular teacher. To what degree can these results be generalized to other students, other teachers, and other units of instruction? Generalization to other units of instruction should obviously be done with extreme care. Because a certain method works with one type of material in no way proves it will work with another. The same limitation applies to generalization to other students and teachers; i.e., the results can be generalized only to other students and teachers similar to those in the experiment. If the students and teachers were not carefully selected it might be impossible to identify any group to which such generalization can be made.

These limitations are directly related to another. Since a methods study is designed to determine the effectiveness of a given method or compare the effectiveness of two or more methods, the results obtained are specific to the particular methods and students involved in the research. Thus, any shift in methodology or students requires a repetition of the research. The millions of dollars and thousands of man-hours spent in research on uses of television in education provide little or no evidence that can be used in evaluating computer-assisted instruction. The same ground covered by the research on television must be covered again by research on computer-assisted instruction and on any new technique that may follow CAI. It is safe to assume that except for the refinements in research and statistical design that have been made in the past 50 years, little in previous methods research is likely to be useful in making the decisions that must be made about the possible usefulness of technology and automation in education. Each such use must be tested individually.

In addition, the nature of methods research is such that valid results can often be obtained only by relatively wide-scale and long-term use of the methodology or methodologies being considered. The effectiveness of educational television cannot be inferred from its use in a few classrooms for a few weeks. Use of the method is required with many classrooms over long periods of time. The cost of such research can be staggering and the results so difficult to assess as to be almost useless.

Frequently little more than guess is involved in setting up a given methodology. The guess may be calculated, based on some previous experience, but it is very much guess nevertheless. All research obviously involves some measure of uncertainty—if there were no uncertainty about the possible results there would be no need to do the research. Methods research frequently, however, has a degree of uncertainty that is out of all proportion to the time, effort, and money involved in carrying it out. Creativity and intuition are fine qualities for researchers to have, but a realistic distinction must be made between creativity guided by knowledge and "harebrained schemes" based on guesswork.

This is not meant to suggest that methods research has no place in the development of a science of education. Such research can, when thoughtfully conceived and carefully planned, make a definite contribution. Such development and planning cannot remove some of the previously cited disadvantages, but can result in advantages that will outweigh them.

Desperately needed are trained researchers interested in instructional methodology and teachers interested in research methodology. It will take both to bring methods research to a point where it will have a very real impact on educational practice. To develop the researchers will require an extensive traineeship program which involves both formal instruction in statistical and research methodology and experience working with practicing researchers. The few courses typically included in present graduate curriculums will probably not induce individuals to become active in research after graduation; students must become involved in and committed to research during their training period.

The possibility of training teachers in research design has been very largely overlooked as a possibility for improving method research. Experience with the North Central Association's attempts to familiarize school personnel with research methodology through short-term workshops has convinced the author that school personnel are both willing and able to profit from such experience. In addition to the specific skills the participants in these workshops acquired, marked changes were also shown in their attitudes toward the usefulness of research as a guide to the classroom teachers. Many teachers would not profit from such instruction. But there are many more who would, and through their combined efforts they could exercise a considerable influence on education. It would certainly be worth the financial investment to give them the chance.

A second type of research that can make a contribution to the development of a science of education has as its objective not the comparison or evaluation of specific methods, but the formulation of principles which play a role in learning regardless of the specific method involved. This is frequently referred to as behavioral science research. Such research may involve elementary school children, college sophomores, chimpanzees, pigeons, or white rats. It may involve a buzzer, paired-adjectives, or an extremely complex problem-solving task. The key consideration is neither the subjects nor the learning material, but rather the principle being investigated. The starting point of such research is not the given group of subjects or set of material used in the methods study, but rather a hypothesis based on an established body of knowledge. The hypothesis determines the nature of the subjects and the material, rather than vice versa.

Among the first to suggest that such scientific knowledge could contribute to education was the German philosopher, Johann Herbart. Teaching methodology had, up to the time of Herbart, gone through a number of phases from the highly developed rhetorical teaching methods of the Sophists through Socratic dialectic to Scholasticism. But these changes had come about, not as a function of an expanding knowledge of the learner or of the learning process, but as a function of shifting philosophies. Although Herbart's views on educational methodology had as little basis in behavioral research as those of his predecessors, he recognized the need for such research and did develop a teaching method based more directly on logic and the psychology available at that time than had any previous writers in education. His five steps in the instructional process (preparation, presentation, association, systemization, and application) actually comprised a theory of instruction, which had as its goal the development of idea clusters that constituted the apperception mass.

Another of the early proponents of the usefulness of behavioral science research to education was E. L. Thorndike. Thorndike made his views on education very explicit when he wrote: "It is the vice or the misfortune of thinkers about education to have chosen the methods of philosophy or of popular thought instead of science." (*Thorndike*, 1903, p. 164.) The science of education that

Thorndike envisaged rested very solidly on direct observation, experimentation and inductive reasoning. He wrote: "A true educational science must be inductive, must be made up from the study of the particular facts in answer to thousands of different questions." (*Thorndike*, 1903, p. 164.)

Thorndike had considerable influence on education during the first three decades of this century, and under his guidance it appeared that a science of behavior might come to be an important force in the development of educational technology. His influence was, however, very largely that of one man. Despite the success he enjoyed at Columbia, few other universities established laboratories and encouraged Thorndike's kind of research. The behavioral science approach did not "catch on" with the rank and file of educators. By the late 1920's the psychology accepted by educators was not behavioral psychology, but phenomenological psychology. The reason is not hard to find: Gestalt psychology was more consistent with the views of Dewey and the precepts on progressive education than was connectionism.

Gestalt psychology began more as a psychology of perception than as a psychology of learning—attempts to make it a psychology of learning have not been notably successful. Its merit was an emphasis on an active, seeking learner, which fit well with Dewey's view that central psychological events are not connections between stimuli and responses but "mediated experiences." Unfortunately it also had a set of concepts which, being more descriptive than explanatory, precluded the possibility of developing a set of principles likely to be useful in manipulating behavior. Despite this fatal shortcoming, Gestalt won the day. To quote McDonald, "Behaviorism went down with Thorndike. The distinctions among the behaviorists were too subtle. In any case, Thorndike and the behaviorists were all cut from the same mechanistic, atomistic cloth. They were all laboratory psychologists. By the time that behaviorists turned to larger social problems, the cause was lost." (*McDonald*, 1964, pp. 20–21.)

Educational psychology, which had shown such promise as a source of educational practice, lost much of that promise when Thorndike's influence waned. A prime reason for this was that the shift of the "accepted" theory of learning from connectionism to Gestalt involved a move from a view of learning that was very researchable to one that was not. The basic question in research in educational psychology is: "How can the teacher best manipulate the learning situation to make learning maximally effective?" Gestalt psychology gives little guidance to research relative to that question.

Connectionism and the behavioral science view of learning were no longer forces in education after the 1920's, but they flourished in psychology. As a result, the period from 1930 to the present has been one of little contact between the science of learning and education.

Although the ultimate objective of behavioral science research is to develop a systematic body of knowledge that yields general principles, there are many ways this can be done and many types of laws which may be derived. As it happened, the methods chosen and the type of laws sought by many involved in psychological research were not those likely to lead to results that would be immediately useful for purposes of application to practical problems. Conversely, those who chose an orientation that seemed to be geared to possible practical applications have not had much success developing laws that can be called much more than "categorized common-sense."

The problem presented by such a state of affairs is that the principles which emerge frequently are only useful in making predictions about behavior in very simple learning situations. Those principles which have wider applicability tend not to yield very precise predictions. For this reason many educators seem convinced that there is no very useful science of learning, and not a few of them are convinced there never can be. There is almost as wide a range of opinion among psychologists as among educators, with many taking the position that the science of learning may be able to make a contribution to education, but that this is a hope of the future, not a reality of the present. Others, notably B. F. Skinner, see the possibility of making immediate application of the science of learning to education and have had some success in doing so.

A major problem associated with the application of principles of learning to educational practice are the boundary conditions of such research; that is, the problem of applying principles which have been developed with certain organisms under certain conditions to other organisms under other conditions. A law based on observation of a rat in a T-maze obviously cannot be assumed to be immediately generalizable to a student in the fifth grade. The learning situation in the latter case involves a much more complex organism and similarly a much more complex learning situation. This is not to say that the principle is not operating in the classroom, but, because of altered boundary conditions, it cannot be assumed to be operating in the same fashion.

Despite this obvious difference, such direct applications are sometimes attempted. One of two things happens. When it does not "work" the person who tried to make it work becomes convinced the behavioral science approach to problems of classroom learning is unfruitful. Or he attempts to restrict the objectives to make them conform to those that can be met under the boundary conditions under which the principle was developed. The first outcome is analogous to denying the usefulness of $F=f(M\times A)$ because knowledge of that one law does not enable one to build a supersonic jet. The second is allowing the tail to wag the dog. Principles of learning should influence not the objectives of instruction but only the methods used to reach these objectives.

A complete list of the general principles that have emerged from behavioral science research is not possible at this point, but a discussion of some of those with widest applicability in education would probably be valuable. For purposes of organization, these will be discussed under four headings: Developmental factors, individual differences, motivation, and learning.

Developmental Factors

1. Human behavior results from a complex interaction of maturation and learning. There has in the past been considerable discussion of the relative importance of these factors in determining human behavior, and this has resulted, on the whole, in the generation of much heat and little light. For purposes of education it must be recognized that maturation places certain limits on what students can learn, but that these limits are very broad. It should also be remembered that what cannot be learned by students of a given maturity when method A is used might be learned if method B were used. Thus, statements about the level of "maturity" required to learn certain things must be interpreted carefully. It also means that care must be exercised when statements are made about the limits age places on ability to learn.

2. Human behavior, because it is so dependent on learning, is tremendously variable. This is significant because it is almost impossible to know exactly how an individual will respond to a given situation since there is no way to know exactly what experiences he brings with him. Even such a seemingly simple word as "dog" will elicit a wide variety of responses from a group of people because of varying experiences. It is absolutely essential when designing instructional sequences to be cognizant of the previous experiences of those for whom the sequences are being assigned. One of the major problems in designing learning materials to meet the needs of our changing society is that these materials must be prepared for people with whom many of the existing educational agencies have had little experience. Because of this, they have little to go on by way of knowledge about what these people do and do not know, or can and cannot do.

For example, this problem of previous experiences is one that constantly faces the middle-class teacher when he teaches disadvantaged children, because he frequently has no idea of what the lives of such children are like. As a result the instructional sequences are often completely out of phase with the child from a lower-income family.

What is needed are new materials that are consistent with his background. The problem is that many of these materials probably must depart rather markedly from those currently used, and the revision and development of materials is going to require time, money, and specially trained personnel.

3. A student is influenced not only by the specific responses he has learned but also by certain generalized responses he has learned. Attitudes and values are examples of these. He has, for instance, probably developed an attitude about school which has a decided influence on how he responds to the teacher as a teacher, quite apart from the way he might respond to him as a person were he not in the role of teacher. If the student has negative attitudes about school, he might not "learn" in the school setting where a particular person plays the role of "teacher," but might learn from this person if he were outside the setting of the school.

These general attitudes are acquired not only as a function of in-school experiences but also of things heard about school from parents and peers. Relatively large segments of our society are in a very real sense alienated from the schools and what the schools are trying to accomplish. The children from such homes frequently come to school with a considerable number of misgivings about what they will find there, and in view of their limited backgrounds for doing the work of the school these misgivings are, more often than not, well-founded.

The phrase "misgivings about," not "antagonism toward," was used in the preceding paragraph deliberately. Although it was at one time assumed that all disadvantaged children and their parents were antagonistic toward education, recent evidence casts considerable doubt on this assumption. Lower-income parents, in general, seem to place high value on an education that might enable their children to be more successful than they have been. The difficulty is that they are skeptical of the willingness of the schools, as they see them, to provide such an education. One characteristic which seems to typify the lower-income group is a desire for relatively immediate "payoff" for effort expended. However, much of what is done in the schools has *future*, not *immediate* usefulness. This is particularly true of the junior and senior high schools.

This suggests, of course, that educational programs for disadvantaged children must emphasize relatively immediately useful knowledge and skills if they are to hold the disadvantaged child and reduce the skepticism the disadvantaged, in general, have about the schools.

4. There seems to be a general pattern that characterizes human development. Although there may be wide individual differences in the ages at which children reach certain points in the pattern, the sequence is very similar for most children.

That the age at which certain points in the sequence are reached varies so widely among children presents major problems in any system of education where chronological age is used as the basis for placement. Such placement is convenient administratively and does avoid conflicts with parents. It is much easier to tell a parent his child must be 5 years old by September 15 or he cannot enter school than it is to say he must have attained a certain level of mental and emotional maturity before his formal education can be started. Rigid adherence to chronological age as the basis for school placement does, however, violate much of what we know about child development. A more active search for a better criterion for placement is long overdue. Automation and technology could well provide the kind of flexibility in school programing that will encourage this search.

5. Mental development shows much the same general pattern as physical development, with rapid growth during the preschool years and a somewhat decelerated trend thereafter. The age at which mental growth stops, and the rate of decline after that point is reached, is a much debated issue. The following generalizations, however, seem warranted:

a. Intelligence probably continues to grow well into the twenties and possibly early thirties.

b. The point at which the growth of intelligence stops is directly dependent upon how it is measured. If the test is one that emphasizes speed, the growth tends to stop earlier than if the test emphasizes past experience and vocabulary.

c. People who remain intellectually active tend to show a longer period of growth and slower rate of decline in intelligence than do those who do not remain intellectually active.

d. Barring physical handicap, adults can learn, often very well, provided the proper motivation is provided and the goals of the instruction are clear.

6. Intelligence results from an interaction of heredity and environment. Because environment does play a role, it is possible to make a child more intelligent by providing him with certain kinds of experience. If a child's intelligence is to change appreciably, the efforts directed towards this end should probably be concentrated in the preschool years. Attempts to alter the intelligence of school-age children have not been very successful.

The implication is obvious. If the schools are to do anything about "adjusting intelligence," the school program must be extended into the preschool years. Programs such as Operation Head Start can provide immediate stop-gap aid, but what is needed are tuition-free preschools in lower-income neighborhoods which are staffed by child-development specialists. At present, the children who attend preschool are those who need it least; i.e., children of middle-class parents. Preschools can serve a more valuable function in our society than providing baby-sitting and an added push for the children of achievement-oriented middle-class parents.

7. Lack of proper stimulation during infancy has a decided negative effect on human development. This effect is particularly pronounced on mental, social, and language development. There also seems to be some indication that this stimulation must occur during certain periods in the life of the child. If it does not, the deficit may never be made up.

8. The need a child has for achievement is a function of a number of forces. Among these are parental pressure for and reward of achievement and a history that shows a relatively high ratio of successes to failures. High parental expectations, provided such expectations are in line with the child's abilities, also seem to be related to an ascending IQ.

Individual Differences

1. There are wide individual differences among persons in virtually all characteristics.

2. Individual differences have two sources, heredity and environment. It is frequently assumed that individual differences due to heredity are impossible to manipulate while those due to environment are relatively easy to manipulate. Like so many assumptions, this one does not hold up under careful scrutiny. There are a number of physical conditions whose source is heredity which can be relatively easily altered, while certain environmentally determined characteristics are extremely difficult, if not impossible, to change. Attitudes and values are examples of the latter.

3. Learners show wide individual differences in performance on intelligence tests which tend to be related to performance in a variety of situations. An immediate problem that arises in any discussion of individual differences is that of scaling the attribute involved. Before it is possible to evaluate the "kinds" of intelligence some method must be found to quantify intelligence in some fashion. The problem is that although this has been done in many ways, there is a fairly good indication that all tests of "intelligence" do not measure the

same thing. There is, however, enough overlap from one test to the next to allow some statement of principles using the term intelligence, but it should be remembered that "intelligence" is not the unitary concept it is sometimes assumed to be.

4. Intelligence seems to consist of a general factor plus a number of specific factors. Although differences of opinion have been expressed on this point, there seems to be a general intellectual factor that influences performance on a wide range of tasks, as well as specific abilities related to performance on a limited number of tasks.

5. The IQ tends to remain relatively stable from age 5 or 6 to maturity and is inclined to be somewhat more stable at the lower levels than the upper.

6. Scores on intelligence tests are related to race and social class. This relationship is almost surely more a function of differing opportunities to learn to be intelligent (to learn the responses called for on intelligence tests) than of genetic factors. In this sense the test may be thought of as a measure of cultural deprivation. However, the occurrence of such differences seems small justification for not using intelligence tests in the schools. They are a useful predicator of school success and so can be used as a basis for providing special instruction. The test simply reflects cultural conditions—it does not create them. Not a single child is made less culturally deprived by not being given an intelligence test.

7. Intelligence test performance does not seem to be very closely related to sex (although males tend to be somewhat more variable), season of birth, or birth order.

8. Intelligent children tend to be somewhat healthier, taller, heavier, more popular and better adjusted than average. The stereotype of the frail, neurotic, gifted child is not consistent with empirical evidence. Very high intelligence, above 160 or so, may present some problems because such children are so unusual that they may be isolated by their intelligence. Their peers do not understand them, nor frequently do their parents or teachers.

9. An individual may not only be not intelligent enough to do one job, but he may also be too intelligent to do another and become bored with it.

10. High intelligence seems a necessary but not a sufficient condition for creativity. Many highly intelligent people are very noncreative. Highly creative people are interested in complexity and novelty.

11. The relationship between intelligence test performance and grades ($r=0.50$) is such that a group of students homogeneous in intelligence will still show a considerable range of achievement.

12. Good teaching results in an increase in the range of individual differences in a classroom. To the extent that a teacher provides for individual differences in a classroom and allows each child to proceed as rapidly as he can, the differences among students at the end of a school year should be greater than they were at the beginning.

Motivation

1. Secondary drives are frequently more critical than primary drives in determining human behavior. Primary drives are those which are inherent in the genetic structures of the organism; for example, hunger, thirst, and sex. The secondary drives are learned; among them are those for status, achievement, affection, etc. In a society such as ours, these secondary drives frequently are the controlling force. A problem is created because, since they are dependent on learning, they vary with the past experiences of students. An "A" from the teacher might satisfy a drive operating in one student but have no effect on the behavior of another because he could not care less about getting an "A." The reward structure set up in a middle-class school may have no impact whatever on a disadvantaged child who has not learned the secondary drives that go with that reward structure.

2. Once a secondary drive has been learned, it tends to increase, like the primary drive, under deprivation conditions. The drive for an "A" and the approval that goes with it tends to increase the longer the student is deprived of it.

3. There is some indication that man learns to be "comfortable" at a certain level of stimulation. When stimulation drops below that level he actively seeks it. Man cannot tolerate lack of sensory stimulation for very long, and anyone who has ever seen a man accustomed to being intellectually active put in a situation where such activity is restricted realizes that this applies to intellectual as well as sensory stimulation.

4. More attention is paid to novel and changing stimuli than to familiar and stable ones. Variety is not only the spice of life, it is the "attention getter" of life.

5. Motives serve three functions. They energize the organism, direct its activity, and serve a selective function. An unmotivated organism is an inactive one. It is the energizing function of

drive which gets the learner moving. The drive does not, however, just get the organism going—it also gives direction to activity. If the drive is hunger the organism seeks food, not sleep. Drives serve a selective function in that the response which is likely to occur in a later and similar situation is that which was rewarded in the previous situation.

6. Some motivation is necessary for all learning, but too strong a drive operation may disrupt performance, particularly if the task at hand is a complex one.

7. A frequent response to a persistent barrier between an individual and his goals is aggression. Although individuals employ many different methods in dealing with frustration, the likelihood of aggression becomes greater and greater if these other methods fail to remove the barrier. It has, in fact, been suggested that aggression is inevitable if all else fails in removing a barrier.

8. When a goal has both positive and negative properties, the positive properties seem more apparent from a distance, but as the goal is approached the negative properties become more and more apparent. In such a situation the approach toward the goal is relatively rapid until the point where negative properties assume considerable proportions is reached, then the approach is slowed. If the goal has enough negative properties it may never be reached. A commonplace example is the groom who leaves the bride at the church door. From a distance, the wedding looks just fine, but as the time approaches the negative properties become so apparent as to precipitate flight.

Learning

1. When a response is followed by a reward, that response will tend to recur. What is rewarding, of course, depends on the drives that happen to be operating at the time. A central problem in education is determining the drive structure of the learner so as to identify what can be used as a reward in guiding learning.

2. When a response which has been rewarded in the past ceases to be rewarded, the probability of its occurrence drops. The technical name for this is extinction. How not to reward behavior is sometimes as complex a problem as how to reward it because what may seem to the teacher to be a nonrewarding response to a student's behavior, the student may, in fact, find rewarding. In addition, the teacher is not the sole source of reward in the classroom. By ignoring a student's behavior he may enable the student to pursue it and reap tremendous rewards from his peers. The general principle, however, stands, for if he gets reward from no one, the behavior will become extinguished.

3. Punishment results in a decreased probability the response will recur, but this seems to result more from an inhibition of the response than from extinction. That is, if a student is showing inappropriate behavior, punishment will reduce the probability the behavior will recur, but when the threat of the punishment is removed the response tends to return as strong as before the punishment. This suggests that punishment adds an inhibiting factor rather than reducing the strength of a response tendency.

4. Reinforcement, to be maximally effective, must follow immediately after the response. The longer the delay between the response and the reinforcement, the less effective the learning. This presents one of the major problems in designing instructional sequences, because providing immediate reinforcement for correct response almost requires a tutorial system. To use teachers for this type of tutorial reinforcement may not be economically feasible, but if the material can be properly prepared, some of the feedback the student needs could conceivably be provided by a machine.

5. A response associated with a certain stimulus tends to be elicited not only by that stimulus, but by similar stimuli as well. If a child associates the verbal response "dog" to the written symbol *dog* he may also make the verbal response "dog" to the written symbol *dig*. In some instances, such generalization from one situation to another helps the learner acquire the correct response in the new situation. This is referred to as "positive transfer." In other instances, such generalization may interfere with learning in the new situation (referred to as "negative transfer").

6. How an organism responds in a new situation is a function of relating previous associations with the stimulus elements in the new situation; i.e., transfer of previous learning. In many ways the basic problem in education is this one of transfer, involving the arrangement of learning sequences in such a fashion that what is learned in the classroom will transfer to situations outside the classroom. Without such transfer, what the student learns in the classroom is very largely a waste of time and money. This is what the term "life adjustment" ought really to mean. When defined in this fashion it applies as much to a good course in physics and geometry for the potential engineer as to a course in typing and bookkeeping for the potential secretary. It refers also to courses meant to have other than direct vocational value, provided we can assume that what students learn in

the classroom makes a difference outside the classroom. The irony is that much of what has been done in the name of "life adjustment" probably has little or no transfer value, while much that has been opposed by the advocates of "life adjustment" has wide potential transfer.

7. Nonmeaningful material tends to be forgotten very rapidly while meaningful material tends to be forgotten relatively slowly. The problem, of course, is the definition of "meaning." It is necessary to realize that meaning is in the learner and is not implicit in the material presented. A given set of material may be very meaningful to one learner to the degree he can bring his past experiences to bear on it. If another cannot do this, the same material is meaningless to him. This is so obvious that it has been overlooked in some discussions of the role of meaning in teaching.

8. Forgetting seems to be in large part due to interference from other learning. It is not just the passage of time which causes forgetting, but also what the learner does during that passage of time. The greater the similarity between what was learned at time A and time B, the more likely the learning at time B is to interfere with retention of what was learned at time A.

This outline of some of the more definitely established principles that have emerged from behavioral science indicates their very general nature. With the typical learning situation as complex as it is, many of these principles are obviously operating at such a time and frequently in such a fashion as to introduce conflicting tendencies. To predict the outcome of instruction as a function of the operation of these principles with any degree of precision is obviously impossible. They do, however, provide some leads which we are considerably better off knowing than not knowing.

We have, then, by way of a start toward a science of education, a considerable literature of methods research and a number of broad general principles of learning, which, while of some use, are not of the type to make very precise prediction and control of classroom behavior possible. The problem then becomes one of deciding how we can use what we have and the course of action that ought to be followed as a next step in the development of a science of education.

Certain assumptions are involved in the course of action to be suggested. The first and most important of these is that the objectives of education in themselves are paramount and must never be compromised to accommodate available methodology and technology. The second is that the primary function of the school is to provide an environment for learning. The teacher is not trained as, nor should he be expected to function as a juvenile officer, therapist, doctor, or parent substitute. He must, of course, concern himself with the physical and mental health of his students, because these factors influence how students learn, but this interest should be subordinate to his primary interest of teaching. No one expects other professionals to be competent in four or five roles. Neither should this be expected of a teacher.

The third and fourth assumptions both relate to views of the learning process. One of these is that classroom learning can be divided into types, and although the same basic principles may operate in all types of learning, it may be more profitable at the moment to stay with the simpler types and try to develop a set of useful principles relative to them. The other assumption is that these principles ought to be developed on the basis of an existing theory of learning which has already generated a considerable body of research.

The last assumption is that language must play a critical role in research on classroom learning. It is perhaps the most powerful force available in dealing with human behavior.

An example of a specific program of research can be used to illustrate how these assumptions might operate in a practical situation. A problem that constantly arises in the education of the mentally retarded is a seeming lack of ability on the part of these children to transfer what they have learned to new situations. A promising approach to transfer is the verbal mediation model developed by stimulus-response psychologists. This model essentially suggests that generalization may occur from one situation to another by mediated generalization as well as by primary stimulus generalization and that words play an important role in this type of generalization. For instance, two situations may be very different, but if the term "danger" is common to both, the responses in the two situations may be very similar. Two people may be very dissimilar in appearance, but if the term "friend" can be applied to both there will tend to be a common response toward both. This type of mediated generalization is a very complex process. But there is enough empirical evidence to suggest it might be profitable to extend it to see whether or not retarded and normal children do indeed vary in their facility for verbal mediation, and to determine whether or not instructional materials which emphasize some sort of training of "mediational skills" might not result in better transfer among mentally retarded children.

The development of these materials would require a chain that would begin with some very basic research on learning and proceed in logical and orderly steps to the actual production of learning materials for classroom use. This is the kind of programed research that has been lacking in education. As it is now, there are those working on curriculum materials and those doing basic research, with few people to bridge the gap. Some attempts have been made recently to get basic researchers together with practitioners in the hope they could be of some aid to each other. Although some progress has been made, the attempts have not been spectacularly successful. There was little reason to expect they would be. The participants do not speak the same language and rather typically do not have the same interests. A few meetings are not going to change this, nor is putting them in the same department or the same building likely to result in the rapprochement everyone seems to desire.

The problem may be one of trying to induce two groups of people, each pursuing its own legitimate interests, to change those interests. Perhaps what is needed is not a merger of existing groups, but rather the creation of a new one to bridge the gap between basic behavioral science and the classroom. This new group would have to be knowledgeable not only about the behavioral sciences, but also about the practical problems of education so that it could design programs of research to relate the one to the other. Much of the work of the researchers in this group would resemble that of the basic behavioral scientist, with one important difference: It would be done with an eye toward its relatively immediate usefulness in a program of research leading to the development of learning materials.

Another important difference is that a single researcher would design and carry out the complete sequence of research from the basic research through to the development and application of classroom materials and methods. This would assure that each step of the sequence would have direction and would "fit" the program. In some cases it may be only a step or two from what is available in behavioral science research to classroom materials, but this would be the exception. In general, such programs would probably involve many studies over a period of years.

The possibility of such programs of research depends, of course, on continuing support of an individual over a period of years. Without such support, piecemeal research will continue to be the rule.

Chapter 8. Educational Policy, Organization, and Structure

The purpose of this discourse is to explore the impact of automation and technological change on the educational policy process, educational organization, and the structures society has provided for education. Issues springing from and intensified by the conflict between dynamic changes in technology and the status quo in education are identified and examined. After touching briefly on background material and identifiable trends, an attempt is made to define a logical position for actions relative to each of these issues.

I. THE POLICY PROCESS

In order to discuss meaningfully the policy process in education, it is helpful and necessary to distinguish between the formulation of objectives and policies and their actual adoption. Formulation is used to indicate the initial creative expression of policy concepts, ideas, or programs. Adoption involves formal acceptance of policy statements with the expectation of actually putting them into operation.

The policy process has no real beginning or ending, but an individual policy has both. Its beginning is associated with the process of formulation, its ending with the process of adoption. Formulation typically is concerned with establishment of goals and the setting of aspirations, whereas policy adoption reflects actual operational choices among alternative goals and aspirational levels.

Lay-Professional Partnership Exists

A partnership exists between lay citizens and professionals in the United States. Policy adoption is clearly an accepted function of elected and appointed school boards in public elementary and secondary education. However, school boards have consistently sought, obtained, and acted upon the advice of their professional leaders—school superintendents. A similar pattern has flourished at higher education levels.

The formulation of educational ideas and programs which eventually become a part of adopted policy has also been a lay-professional partnership process. Throughout our history, professional leaders and prominent citizens can be identified as having made mutually beneficial contributions to this policy formulation process.

Professional Influence. It is perhaps true that professionals have for some time exercised an increasing influence in the formulation of educational policy. Ideas related to policy change in education can often be traced to professional educators individually and in concert. Early schoolmasters became famous by initiating changes in objectives and policies. University and collegiate scholars stimulated early policy formulation not only within their institutions but among elementary and secondary schools as well. After a period of inactivity, the voices of these scholar-professionals are again being heard.

Lay Influence. Notable exceptions to the thesis of an increasing professional influence have occurred in the last decade. Pronouncements from prominent citizens regarding educational policies and goals have been adopted. The suggested educational changes are often directly derived from social and technological changes. The growing aspirations for universal continuing education in combination with quality and excellence have been voiced repeatedly in recent years. Perhaps existing institutional inertia has too often led to disregarding or dismissing what wisdom is contained in the assertions of these nonprofessional policy formulators. This would not be wholly unexpected inasmuch as it is eternally difficult to distinguish the wise from the foolish spokesman. The questionable shortcut of relying on an individual's degrees or experience as credentials for validation of wisdom cannot be easily applied to nonprofessionals.

Change Requires Cohesive Policies. In recent years, educational leadership has been concerned with creating cohesive policies in order to better adapt to increasing knowledge, specialization, and technology. The formal and informal procedures we have provided for educational policy formulation and adoption contribute to institutional sluggishness in adapting to change. The fact that professional advice is adopted by lay boards cannot logically lead to the conclusion recently professed that professionals are responsible for a sluggish "establishment." Rather, the partnership shares this burden and the partnership should find a solution.

The power to adopt objectives and policies is held by lay members of local school boards, county education boards, State boards of education, State boards of regents, and similar agencies. Analyses of board meetings show that the majority of board time is devoted to many mundane tasks rather than the establishment of broad goals and in evaluation of program consequences. The policy function of these boards has been and continues to be the actual expression of the public interest in education. The longstanding practice of lay policy adoption with professional advice and policy formulation by mutual lay-professional interests has bumbled along for years. Surprisingly, this educational partnership has been both productive and effective. However, continued bumbling cannot possibly meet today's needs for cohesive policy and effective educational organizations. We need to streamline the policy process to better meet changing conditions.

Policy Process Varies by Level of Organization

The policy process varies between the elementary and secondary level and higher education. The foregoing aspects of the policy process were drawn primarily from public elementary and secondary education. Historically, higher education has developed apart from elementary and secondary schools. Elementary school programs have been fairly well coordinated with secondary schools because of a unified organization for policy adoption and administration. School districts devoted to only one level—elementary or secondary—still persist, but they are educating a minority of the Nation's students. They are characterized by generally poor curriculum articulation between elementary and secondary levels. Vertical articulation problems between secondary and higher education have plagued society in the past and continue unresolved to this day. Policies for higher education, more often than not, are formulated and made operational apart from elementary and secondary education.

The policy function is not cohesive even within higher education. In some States, boards of regents or boards of education have a consolidated interest in the policy determination for all or nearly all public higher education. Often several separate policy groups within a State control public education, with one board for community colleges, another for State colleges, and yet another for the State universities. Private colleges and universities generally determine policy institution by institution. Add to this vocational education boards and the organizational confusion associated with continuing adult education, and current policy confusion can be better understood. Pressures are being exerted to develop superboards, or boards over boards, in an attempt to coordinate overall educational policy. Typical policy adoption processes separate higher education policy from elementary and secondary education policy. Existing political and traditional concepts will have to undergo sharp modification if we are to attain a cohesive educational policy through the establishment of educational policy boards responsible for all education, preelementary through higher and continuing education.

State Function. By constitutional discretion as well as through specific statutes and State constitutional provisions, public education in the United States is legally a State function. Traditionally, States have delegated to lesser agencies much of this power. The 50 State legislatures nevertheless constitute major policy instruments of society. In each State the legislature constitutes the "big school board." Nowhere is the dilemma of power delegation felt more strongly than in the current renewal of effort in establishing postsecondary institutions. Junior colleges and area vocational-technical institutions are receiving renewed attention across the Nation. As resources become available for these institutions, the question of coordinating them with elementary and secondary schools, as well as with other higher education institutions, becomes crucial.

In the past, local school districts attempted to provide individual opportunity to their residents by structuring junior and community college programs within the organizational framework of the local district. All too often the limited resources derived from local property taxation could not adequately support a quality program in these institutions. In some instances post-high school education has been provided by an intermediate organizational structure which could tap larger resources and serve broader segments of society. State grants-in-aid have been increased in the past decade in an attempt to overcome organizational defects associated with community colleges. In no case have we met the need for broad gage policy formulation and closely coordinated policy adoption. Articulation of programs between secondary education and higher education as well as among colleges and universities remains primarily unresolved.

Local Autonomy. The main operation of elementary and secondary education is to be found primarily at the local level. In the past, the relationship of the local school district to its amicable partner, the State, has been an attitude of toleration and distance. The local school felt relatively autonomous and acted on this feeling. Poor transportation, inadequate communication, and economic isolation, resulted in the strengthening of the tradition of local autonomy. Changes in these environmental factors, in combination with an increasingly mobile population, have intestified the need for unified and coordinated educational agencies. No longer is it desirable to develop educational opportunity around the needs of separate small communities. Educational institutions must become more cosmopolitan in their concept of community-oriented education since individuals educated in one community can be expected to live in other communities the major part of their adult lives.

The natural nominee to meet this need for cosmopolitan opportunity has been the State itself. The current tensions of change threaten friendly relationships between State agencies and local agencies. A similar pressure for integration and coordination of educational activities has forced the Federal governmental structure to take a more active role in organized education. The trend is clearly to centralize the management and policy processes for organizations and institutions associated with education. Local autonomy as we once knew it is already a dead issue. In order to maintain local effectiveness, cooperation and collective action at the State level is now required.

Governmental Structure Affects Policies

Historically, educational policy adoption has resided almost solely with the local public school board. In the past quarter century, a modest shift has occurred in terms of strengthening the State role in policy adoption processes. This shift is not unrelated to the massive increases in State grants-in-aid during this period. Intermediate school districts, such as county school units, served a vital purpose in the early development of our public education enterprise. In sparsely populated areas, the decentralized approach to educational organization required the services of business management and educational supervision provided through such intermediate units. As local school districts developed in strength and professional competency, the need for an intermediate organizational level decreased.

In recent years the trend has been to utilize the fabric of intermediate organizations to provide educational services not as yet available even in the typical self-sufficient local school system. Such services include special education teachers, library services, remedial teachers, health and attendance services, data processing facilities, and similar specialized activities. Specific grants-in-aid from both State and Federal sources tended to stimulate and maintain such activities at the intermediate unit level. The result has been a useful, but cumbersome and conflict laden, promulgation of policies and practices related to these special interest areas of education.

The governmental influence on policy from a national level is expressed through a diversity of agencies and departments in addition to the U.S. Office of Education. Each of these agencies has relationships with States and local districts as they administer Federal programs affecting education. Congress itself has recently played a larger role in policy formulation and adoption as Federal participation in education has increased. The executive branch has also been drawn directly into the policy process as an expression of the public will toward education becomes increasingly a prime issue in the political arena. The diversity and intensity of recent Federal involvement in education is a reflection of growing public concern.

The rapidly increasing amount of attention accorded education has resulted in confounding the traditional policy processes and creating instability in and among governmental structures. Unpracticed participation in the policy process by these many diverse agents, all attempting to cope with rapid change, has helped create the existing conflict and contradiction expressed through legislative policy.

Governmental Financing of Education. Over a period of time, there have been modifications of the structures we have built to satisfy the demands of a broad, free, public education in America. One major modification has been the manner by which we have financed education. Historically, the organization of public education at local levels dictated primarily local financing. The original and continuing instrument of major support was the local property tax. As sophistication in the education process increased, and as larger numbers of our population entered educational institutions for longer periods, the public investment also increased. The required dollar increases have been borne largely by the property tax itself, and by some support from other sources such as State and Federal taxes.

At present, the major ability to tax public resources resides not with local or State authorities but at the Federal level. Local units of government have the least ability to tap resources and the greatest responsibility for policy adoption. This contradiction has given rise to conflict, tensions, and unresolved financial crises which remain with us for future solution.

Adaptation for a Changing Role. Attempts have been made to overcome the pressures of expanding knowledge and growing specialization. Administrative wisdom counsels that individual school leaders should have a good deal of autonomy in the selection of staff, curriculum development, and in all the intimate details of the learning environment. While this produces a dynamic and creative situation in which some very fine teaching and learning can take place, it is possible to have a completely inconsistent educational program within a single school system. Thus, we find structures developed which provide for districtwide coordination of curriculum and specialists who give their time primarily to the needs of keeping the educational program in that school district modestly coordinated. This internal structural adaptation to the need for coordinated policy and programs must now be somehow duplicated among levels of education as well as among governmental structures.

The internal structure of education must also adapt to changes in the attitudes of professional educators. There has been an increase in professional aggressiveness among teachers and professional workers in education. Educators are more and more entering into the give and take of legislative policymaking through organized politics. Professonal associations are growing in militancy and effectiveness in striving for better personal and professional conditions within education.

This new assertiveness, when associated with the traditional American ideal of academic freedom in the classroom, can result in an integrated program only with strenuous and cooperative leadership.

At present we find some innovation in classroom structure in the less rigid use of professional and student time and in the more imaginative use of physical resources. A few pioneers are attempting to adapt recent technical advances within the traditional educational structures. The fact remains that the typical classroom structure in elementary, secondary, or higher education has not significantly changed. The technical capabilities for change have now presented themselves. The opportunity to reexamine internal structures of institutionalized education has now become a reality. The needed technology and resources are available if their appropriate application can be determined.

II. POLICY ISSUES RAISED

The intensification of change related to technological, social, and economic forces raises anew several issues of long standing. The impact of these changes affects educational policy, organization, and internal structure. Specifically, the use of data processing and computer hardware in education possesses potential of significant proportion. Leaders and policymakers are forced to think more precisely about where they are going and how they will get there. Objectives, goals, and operational policies must be carefully analyzed, a priori, before the hardware can be effectively used.

Increased precision in planning can create more effective communications and enhance participation of both public and professional voices in policy deliberations. Business, industry, and Government interests have employed operational research, program evaluation and review techniques, information retrieval, and general management systems for some time. Pioneers in educational technology have also been adapting and fitting technological innovations to the needs of education. Many of these efforts are in an elementary stage of preparedness, others are nearly ready for broad application. Some of the effects and a few of the procedures warrant attention as they impinge on policy processes.

Professionals Versus the Public

As education has become more complex, public policy participation has become less knowledgeable and less effective. Professional policy administrators could make use of new technical tools to better interpret professional problems to the public. Techniques can be employed to predict anticipated population growth and school housing requirements, to better fit staff capabilities to the requirements of the teaching program, anticipate possible effects of policy change, and create depth data feedback for public policy bodies. Improved data collection procedures and integration of available data can provide information with whch educational specialists—guidance workers, measurement specialists, curriculum specialists—can better manage their assigned activities. Educational leaders, given appropriate resources, could command the tools to collect, assimilate, digest, analyze, and disseminate information about the educational process to policy participants and to the public in general.

Academic Freedom. The broad issue of public versus professional policy participation in education is underscored by the long tradition of academic freedom in the classroom. It should be noted that the operational implementation of policy takes place in the intimate relationship of the teaching-learning situation—possibly to the complete exclusion of influence from policy, administration, curriculum, textbooks, or any other impinging controls placed upon the educator. The commitment of a broad national aspiration, internalized by individual educators and accepted by individual learners, is the ultimate safeguard for the control of educational policy.

Academic freedom and individually oriented learning opportunities can be extended and amplified by appropriate application of new technical tools. Unlimited academic license and completely individualized opportunities still remain beyond the economic grasp of society. Policy processes based on the force of logic and adequate information can mediate between desired ends and existing means. The very technology which makes effective change possible can also be used inappropriately in the management control, policy adoption, and policy formulation processes.

Costs of Consensus. Economic growth and technological advances make it possible to take a fresh look at policy participants. Shall educational policy be formulated and/or adopted by the public in general or by professional spokesmen? Public consensus and professional good faith, both human controls, are necessary in the development of maximum effectiveness of the educational enterprise. A balance between public and professional participation in the policy process is desirable. Consensus can be won but only with increases in costs.

While technological innovation relating to the policy process is now judged feasible and practical, there remains a gap between theory and practice. Massive allocation of resources and ardent marshaling of professional concern must be directed toward closing this gap. Without this effort, forces of stability and status quo as well as the natural human reluctance to make any change, much less a change of this proportion, will mean a slow, costly, haphazard attainment of any benefits from technological improvements.

Centrality Versus Dispersion

Technical tools and the release of resources can change not only policy processes but also the organization and structure of education. What and how we teach should determine the governmental organization and internal structures we provide for education. The issue of centralization is raised anew in relation to educational organization and structure. Professional use of technical tools has an impact on classrooms and school procedures which forces a new look at centralization.

What and How We Teach. It is impossible to discount changes in the content of educational programs associated with automation. We must teach about automated production tools, computers, and similar mechanisms as subject matter simply because these devices exist and knowing of them constitutes a part of knowledge. The conceptual approach to old problems has also been changed by these new tools. Since every individual will more than likely be exposed to this equipment during his lifetime, it is prudent to provide him with a broad understanding of his new tools, their values, and limitations. Similarly, it is necessary to teach about the effects of automation on values held by society.

In recent years the concept of programed instruction has been given considerable attention. This attention has been relatively superficial as it relates to the learning process. It is known that carefully sequenced learning materials can be directly introduced through computer components in such a manner as to substantially increase the flexibility and consistency of presentation. The consequences for learning theory and teaching methodology are largely untested. Certainly the few existing experimental programs can be called anything but conclusive. Integrated evaluation and controlled observation represent attributes of computer-assisted instruction as yet relatively untouched. However, the potential is staggering indeed. Here is a medium which promises to present given content in a variety of modes, at different levels of abstraction, with varying degrees of comprehensiveness and at differing rates. The role of the teacher as mediator, integrator, motivator, and learning guide could be enhanced through this medium. If this promise is met, individualized instruction can become a reality.

Centralization Now Tolerable. The simple, practical, everyday educational applications of automation make a difference in the amount and kind of centralization that can be tolerated. Many of these applications are clerical in nature, such as the preparation of academic report cards for parents, attendance-reporting procedures, and the maintenance of cumulative records for each child. Others involve statistical calculation and analysis dealing with academic marks, standardized and classroom tests, variable student characteristics, and community, home, and economic variables. Perhaps even more significant than these are applications associated with more flexible use of the schoolday and the school staff. Few humans have the capability of keeping all possible permutations in mind as they design a schedule to optimize the use of a large staff in meeting the program needs of many individual students.

Keeping track of individual achievements and general school records for large numbers of pupils constitutes large-scale paperwork. If all these applications can be planned in an integrated systematic fashion, then data never before available can be abstracted for analysis and dissemination. Data can be physically compressed and stored for longitudinal research use. Greater meaning and understanding can be derived from information by combining school finance and facility data with the facts flowing from these student, staff, and program applications. If the need for centralized information can thus be satisfied, the actual teaching-learning process can function independently. Classes and individual study could be planned as dispersed activities.

Applications of technology have a real impact on the organizing of educational institutions. A single policy board and its executive officers can apply technologies to administer a large scope of educational activity, maintain effective fiscal control, and at the same time increase the individualization of learning opportunities. This appears to be a situation in which we find ourselves eating our cake and having it too. The mysteries of these dynamic changes have not yet been explored, but it would appear that this is, in fact, the case. In the framework of the central versus decentral conflict, it appears that it is now possible to centralize school districts even further for maximum effectiveness while at the same time maintaining, and perhaps increasing, the probability of dealing more effectively with individual students and professionals. No longer should it be necessary to determine school district boundary lines in terms of tax rates. It should now be possible to organize education around educational effectiveness and capabilities for improving and enhancing individual opportunities of students rather than athletic team strength or community survival.

Strength Through States. It is conceivable that the various levels by which we have traditionally structured education, i.e., elementary, secondary, and higher education, will no longer be applicable in an age where education is a cradle-to-grave affair. Just as we can envision changes in the traditional levels of educational structure, so too can we see possible changes in local, intermediate, State, regional, and Federal organizations associated with education. Local flexibility can be developed and enhanced, while at the same time the organization of governmental agencies responsible for education can be strengthened.

The logical emphasis would appear to be on strengthening the States. What might be called autonomy in a prior societal environment must be judged anarchy relative to today's need. It is unrealistic to expect relatively small local school units to command the needed leadership or bargain effectively with diverse agencies of our Federal Government. Local unit leadership must reach accord, choose a spokesman, support him in the role of chief State school officer, and bargain from the position of strengthened State departments.

State departments traditionally have tended toward a maternalistic role in education and consequently have exercised little real authority. The typical State educational department is less effective than it should be for existing purposes. New functions, demanded by forces of change, require strength at the State level in speaking for constituent local school units.

District reorganization remains as a major problem in bringing efficiency and effectiveness to education. In the fall of 1964, we had about 29,000 public school districts in the United States, some 3,000 of which did not operate schools. We could possibly attain as few as 10,000 school districts by the middle of the next decade if current activities along these lines continue at their present rate. This is still a mighty diversity of direction for a Nation which must deal responsively with a tremendous scope of dynamic changes in society as well as confounding advances in knowledge. The approach of strengthening the 50 States follows constitutional tradition and legal precedents in our Nation. This much centralization could be advocated and quickly implemented for public advantage while maintaining a steady pace of strengthening the individual local partners to the marriage.

Public Versus Nonpublic

A major issue in American education has centered around the determination of control and operation. Public education has aspired to provide opportunities for large numbers of individuals in society. Nonpublic education has served the necessary function of providing an outlet for individuals who sincerely protest the available public program. In addition, it has served the educational goals of church, industry, business, and commercial interests at every level. The impact of technology on this issue is felt to be significant.

Costs of Retooling. In order to capitalize on the new technology, education must retool. The machine tools of learning will prove to be a large investment. Financial practice has traditionally placed emphasis on education's operational costs. In fact, the major costs of education today are the salaries and wages paid its personnel. Any group or agency able to purchase talent can, even with makeshift facilities, establish a reasonably sound educational program relative to public program offerings. If education is to maximize its effectiveness fully in using new technological tools, it will have to pay for the appropriate technological research, development, and implementation activities. The ante to play the game has thus been increased.

The stage is set to achieve a measure of unit economy in the educational process through applications of automation. At the same time, this will require large initial capital investments. The automobile manufacturer who cannot afford to retool his assemblyline loses a full share of profit because he cannot effectively compete. Education must compete effectively with other elements of society for support. This support is based on satisfaction, and any structure which produces too little satisfaction will suffer. Public resources could with some effort be made available for universal public education at high levels of quality. However, nonpublic education does not share the public purse. Assuming this remains true, nonpublic education must seek large amounts of new money, concentrate its efforts on only essential elements and levels of education, or retire from the field entirely.

Pressures, Counterpressures. There are serious pressures which could decrease the proportion of our society educated at public expense. One of these is the integration issue, which has spawned a small but alarming number of nonpublic schools protesting national legislation. Urban decay continues to pressure urban residents into enrolling their children in nonpublic institutions. Social prestige, perhaps misplaced but nevertheless a formidable pressure, continues to generate desire for nonpublic educational facilities.

Our culture has consistently reaffirmed the privilege of substitute or protest educational facilities for genuine minorities. It is often argued that such schools really complement rather than compete with public institutions. It is contended that some competition between nonpublic and public agencies keeps both at optimal levels of quality in their offerings to members of society. It is also maintained that nonpublic programs complement those already available and at the same time ease the burden on taxpayers since the students accommodated would otherwise be educated at public expense.

It can be argued just as forcefully that duplication of facilities, redundant programs, and real competition for resources do in fact exist. The affluent society can tolerate a considerable amount of such inefficiency. However, if all existing pressures go unchecked, no foreseeable level of affluence can support the requirements of universal continuing educational opportunity duplicated by public and nonpublic agencies.

While there are pressures for an increase in the nonpublic sector of education, there are also counteracting pressures tending toward an increased emphasis in the public sector. The increasing mobility of our population has resulted in growing demands for uniform quality upon the public educational enterprise. The necessary capital investment in education to cover retooling costs argues for tough, single-minded emphasis on public educational activity.

Universal Education for Individuals. The public-nonpublic issue in education must include consideration of the various responsible and participating agents in the educational process. There is, of course, the individual. His capabilities and his opportunities are at stake in the planning of a maximally efficient and effective educational system in America. But, in addition to the individual, there are responsible claims which can be pressed by the family, the church, and the State. The educator's emphasis resides with the individual and with providing maximum opportunity for the expression of his individuality. Pressures of an increasingly mobile, urban, specialized, and technology-focus society necessitate an increased vigor in pressing for the rights and responsibilities of the individual. The ultimate needs of family, church, and State depend primarily on strong, capable, vital, concerned, and knowledgeable individuals.

The State has need of citizenship of an increasingly high order. It needs political involvement; it needs a law-abiding citizenry; it needs an esthetically sophisticated society; and it needs vocationally competent economic units. These needs resolve themselves in an increased effort by the State to coordinate, integrate, and emphasize a completely educated citizenry. The individual must be given precedence over claims of family, church, and State. Universal education which continues from cradle-to-grave and is made freely and publicly available has renewed meaning and importance in an age of continual change and adaptation.

III. POSITION FOR EDUCATION

Innovation and invention are not new. All ages and all of mankind have had to deal with change. At some times change is more frightening than at others. Our horizons are perhaps more unlimited than the horizons of the past. We can no longer grope, touch, and feel our way through change. Conceptualizations of relativity and atomic structure and human behavior have stretched the limits of the known and unveiled a fantastic scope of unknowns. When affluence has been attained, particularly to levels anticipated in the United States, there seems to be no valid reason to subordinate all social life to stark economic activity. Under such conditions it seems reasonable to allocate our affluence to culturally profitable activities such as education.

Few seem willing to argue whether or not we are witnessing technological change. Most will agree that we are. Many are concerned, and rightfully so, whether or not the pace of change is increasing, decreasing, or steady. Many are concerned, and rightfully so, whether or not technology is causing ills in society or if society is creating these ills apart from change. However, few have considered fully whether or not this technological revolution is different or the same as former revolutions.

A case can be made that the impact of the new technology is similar to that of industrial change when machines took over the manual chores of broad segments of the world's population. At first blush, computers and other automated devices would have the appearance of a further extension of past major innovations. It can be argued logically and quite convincingly that, in the arsenal of technological change, the computer represents something new and different. For the first time, human mental capacity as opposed to physical capacity has been extended. If indeed this change is unique and different, we can anticipate even more radical change than heretofore experienced. Not possessing the vantage of history, we must work with assumptions and givens as we now perceive them. Without doubt, we must find some way of dealing with the change whatever the rate, whatever the result, whatever the nature of that change.

Ways of Meeting Change

It is evident that technological innovations have increased pressures on all elements of society, but on none so sharply as education. The forces of change are creating pressures on the organization, structure, teaching content, and teaching methodology in education. Education can meet the problem of technological evolution by turning the causal forces back against themselves. Such a confrontation would mean changes in our governmental organization for education, changes in the tradition-bound levels within the profession, changes in the internal structure and administration of education, changes in policy formulation and adoption processes, changes in the content of our curriculum, and changes in the manner in which we teach. Skillful employment of tools can help meet the challenge of change.

Fiscal Tools. One of the first tools which can be employed is the tool of financial resources. Any release of major financial resources must of necessity tap Federal, State, and local funds. A logical approach to ascertaining appropriate proportions for each would be to measure the tax capability of each level of government and to distribute equally the tax burden relative to this capability. This would obviously result in a considerable increase in financial participation by the Congress and also by many States.

It will be costly to retool educational structures and processes, but the economic return from investment in education has been shown to be surprisingly large. The return has come in a new kind of capital recognized as human intellect. It is this particular kind of capital which appears to have considerable promise in a societal system depending to a great degree on technology for its economic well-being. As society struggles for ways and means to deal with the changing times, it would appear that a major investment in public education would yield as much or more as any other known "public works" alternative.

Educational Tools. An entire people must be educated in the problems, advantages, and limitations of new knowledge and technological changes. Logically, a starting point would be to educate the educators. Beyond this, these educators should be employed in a truly universal educational program made freely and publicly available to the entire society.

Technical Tools. Business and industry have already capitalized on the advantages of new technologies and automated processes. The beginning they have made can be confidently expected to increase over time. Education has made relatively little use of technological advances in the internal process of transmitting the culture and in creating new knowledge. Confusion can be lessened in dealing with change by maintaining an educational program as close as possible to the cutting edge of knowledge.

Organizational Tools. It can be safely assumed that the natural forces of institutional resistance to change as well as natural human apathy toward the novel will prevail. Few radical changes in policy, organization, or operational structures are anticipated in the immediate future. If this should prove true, it would seem reasonable that the moderate position favoring the strengthening of State governments in the local-State-Federal educational partnership would be an effective means of dealing with change.

It seems to be a defensible position that all possible effort be brought to bear on the existing chaos in articulation of educational experiences from level to level. A better means must be found to coordinate public and nonpublic educational programs of elementary, secondary, and higher education. The employment of technological advances can provide the advantages of central cohesive policy formulation and adoption while at the same time maintaining effective decentralized operation.

Policy Bodies Recommended

In order to integrate and maximize the effectiveness of policy formulation and adoption, some partnership of public and professional forces must be provided. It is not enough to cry out against the establishment. It is not enough to cry out against public apathy. A position is needed. With an understanding of the policy process, with the issues before us, and acknowledging an imperfect understanding of the real nature of the impact of the forces pushing at society, it seems that some position can be stated and recommended for judgment by the people.

Proposed National Council. An agency, national in scope, must be cast in a new mold to undertake the task of public educational policy formulation. Such an agency might take a form similar to the existing Council of Economic Advisers. A partnership must be created which capitalizes on specialized professional and scholarly guidance while maintaining proper perspective for the values and goals held by the public at large. Policies formulated would be accepted by the weight of logic and by the prestige attached to the commission and the individuals serving on it.

A Council of Educational Advisers should be established as a mechanism to better formulate educational objectives and policies. Such a mechanism should be established in the Executive Office of the President. No more than half a dozen recognized educational leaders and scholars should be appointed to the Council by the President with advice and consent of the Senate.

The purposes of the Council could include such functions as:

1. Assist and advise the President in facilitating the national concern for quality universal educational opportunities.

2. Appraise the variety of Federal program activities in education (National Aeronautics and Space Administration, National Institutes of Health, National Science Foundation, Office of Economic Opportunity, Department of Defense, Office of Education, etc.) to determine the extent to which these are contributing to the achievement of accepted policies and objectives.

3. Develop and recommend to the President national educational policies and objectives to foster educational excellence and to maintain high levels of universal and individual educational opportunities.

4. Analyze and interpret educational information in the light of national educational policies to determine whether current trends will interfere or assist in the achievement of objectives.

5. Disseminate information and logic related to national objectives and policies through the President to the Congress and the people.

If such a council is established for education it would warrant further replication of the economic council in the establishment of a joint congressional committee. Congress needs information to create meaningful legislation with a minimum of friction and duplication among programs. A "Joint Committee on the Education Report" could be established to serve this need. The proposed Council of Educational Advisers would publish reports on policies and information periodically. It would be a function of the council to work with congressional committees, all agencies of the Federal Government, private foundations, and State and local agencies as well. It would be surprising, indeed, if these new educational advisers and the existing economic advisers did not find a mutuality of interest and concern. The primacy of education as an economic tool is continually gaining visibility.

Compact for Education. It is not enough to develop objectives and policies for a variety of educational programs. These policies have to gain wide acceptance and become internalized in every classroom to become effective. The recently adopted National Compact for Education appears to have the characteristics which would serve this need. The compact would provide a mechanism for the local-State-Federal educational partnership to focus on policy adoption and operational implementation. The general approach of the compact appears to strengthen lay-professional participation in planning educational operations within the natural political environment. Each party State would be represented by its governor, a legislator, and five others appointed by the governor to represent State and local professional, lay, and elementary, secondary, and higher education interests.

The expressed purposes taken from article I of the compact are:

> SECTION A. It is the purpose of this compact to—
> 1. Establish and maintain close cooperation and understanding among executive, legislative, professional, educational, and lay leadership on a nationwide basis at the State and local levels.
>
> 2. Provide a forum for the discussion, development, crystallization, and recommendation of public policy alternatives in the field of education.
>
> 3. Provide a clearinghouse of information on matters relating to educational problems and how they are being met in different places throughout the Nation, so that the executive and legislative branches of State Government and of local communities may have ready access to the experience and record of the entire country, and so that both lay and professional groups in the field of education may have additional avenues for the sharing of experience and the interchange of ideas in the formation of public policy in education.
>
> 4. Facilitate the improvement of State and local educational systems so that all of them will be able to meet adequate and desirable goals in a society which requires continuous qualitative and quantitative advance in educational opportunities, methods, and facilities.
>
> SECTION B. It is the policy of this compact to encourage and promote local and State initiative in the development, maintenance, improvement, and administration of educational systems and institutions in a manner which will accord with the needs and advantages of diversity among localities and States.
>
> SECTION C. The party States recognize that each of of them has an interest in the quality and quantity of education furnished in each of the other States, as well as in the excellence of its own educational systems and institutions, because of the highly mobile character of individuals within the Nation, and because the products and services contributing to the health, welfare, and economic advancement of each State are supplied in significant part by persons educated in other States.

The compact has the expressed purpose of research and study in the field of education. The party States will contribute information for comparative purposes, and a steering committee of 30 members would work with Federal representatives and professional consultants. While the compact aspires to include both policy formulation and educational research activities, its major contribution will no doubt come through debate, discourse, consensus, and operational implementation of educational objectives and policies. This is a worthy contribution and can be commended as a natural complement to the national advisers' proposed role in providing cohesive policy formulation.

Chapter 9. The Role of the Federal Government in Education

I. INTRODUCTION

The national of another country visiting the United States soon learns that this country is different from most in the administration of its educational program. There is no national ministry of education; there are 50 State systems of education. Still, more than a score of Federal departments and agencies have some type of relationship with the public schools. A Federal Office of Education is located in the Department of Health, Education, and Welfare. The administrative head of this office is the U.S. Commissioner of Education. Recently, a new post was created in the office of the Secretary of the Department of Health, Education, and Welfare—an assistant secretaryship for education. It is apparent that increasing importance is being attached to the role of the Federal Government in education. Possible establishment of education in a cabinet level post has received serious discussion.

The influence of the U.S. Office of Education is felt principally through the leadership proposals advanced by the Commissioner and members of his staff through consultation services of the Office of Education to State school systems, and particularly through the administration of specific grants which provide financial aid to State and local school systems for particular school programs.

Although many of the problems confronting education are of national concern, national leadership must be focused on means of coping with educational needs primarily through existing State systems. Developing practical procedures for improving the local-State-Federal partnership is one of the pressing problems of the day.

It will be the purpose of this chapter to describe the historical interest of the Federal Government in education, to discuss the issues that revolve about Federal financial assistance to educational programs, and to consider how the national interest in education can best be served.

II. THE HISTORICAL INTEREST OF THE FEDERAL GOVERNMENT IN EDUCATION

Land Grants

Prior to the adoption of the Constitution, the Continental Congress provided that one section of every township should be reserved for the support of the schools in each township. This early provision of general support was the forerunner of later land grants authorized by Congress when new States were admitted to the Union. All told, 30 States had stipulations in their enabling acts providing that one or more sections in each township be set aside for educational purposes. The income derived from these lands was not earmarked for any particular aspect of the educational program. While Federal assistance started out as unspecified, nearly all financial assistance from the Federal Government since that time has been particularized aid for specific purposes. Indeed the land grants authorized under the Morrill Acts which brought about the establishment of land-grant colleges decreed the kind of institution that was to be supported—colleges having as their primary purpose the teaching of "such branches of learning as are related to agriculture and the mechanic arts. . . ."

Vocational Education

A second type of Federal assistance has reflected the concern of the national Government for vocational education. The Smith-Hughes Act of 1917 provided Federal funds (to be matched by each State) for vocational training in the fields of agriculture, industry, trade, commerce, and home economics. Successive acts have extended this initial support. The most recent act, the Vocational Education Act of 1963, calls for adaptability in programs to meet the varied occupational needs of the mid-20th century—and in programs to serve individuals in all stages of vocational competence, including school dropouts, the unemployed, and those whose employment demands vocational upgrading or retraining.

Depression Measures of the 1930's

A wide variety of measures was adopted by the Congress during the depression years of the 1930's. Many of these acts were designed first, to relieve unemployment, and second, to provide increasing educational opportunity. School construction received Federal financial transfusions as part of the national program of public works. The Civilian Conservation Corps employed older youth in conservation projects, and at the same time sought to remedy the gaps in general education needed for employment as well as teach some specific skills. The National Youth Administration encouraged young people to remain in school and college by subsidizing school-devised jobs, such as assisting teachers with the clerical work or serving as laboratory assistants. Some of these programs are analogous to the Job Corps and the Neighborhood Youth Corps now functioning under the Economic Opportunity Act of 1964.

Manpower Development and Training Act

The Manpower Development and Training Act of 1962 established vocational training programs for the unemployed and the underemployed with subsistence allowances for those engaged in the programs. The determination of courses to be taught and the selection of persons to be involved in the classes is the responsibility of the U.S. Department of Labor, but existing public and private educational institutions are engaged to do much of the actual teaching. On-the-job instruction under certain circumstances is authorized as well.

Assistance to Defense-Impacted Districts

During World War II, large military installations and defense plants sprang into being, placing nearly impossible demands on school districts for the education of the children of the military and defense workers. To alleviate the load placed on these school districts, Federal aid was given school districts in proportion to the percentage of children whose parents were engaged in local military and defense employment. Federal funds went both to building and operational needs. The districts, known as "defense-impacted districts," continue to receive funds under Public Laws 815, 874, and 89-10.

National Defense Education Act

The National Defense Education Act was signed on September 2, 1958. To a large extent, its initial provisions were the response of Congress to the impact of sputnik. The very words "national defense" imply that assistance is needed to our educational system if this country is to survive and retain a position as a world leader. The assistance given is intended to be stimulative in character. Funds provided under this Act included equipment grants for the improvement of instruction in science, mathematics, and modern foreign languages; teacher-preparation institutes in these same fields to upgrade instruction; the establishment and operation of modern foreign language centers in selected universities; and the inauguration of a Science Informational Service. Loans for undergraduate students and fellowships for graduate students were also included. Guidance services in the schools received stimulative grants with the provision that the State plan for guidance services must include a statewide testing program. Institute contracts for the training of counselors in selected colleges were authorized. Research funds were made available to develop audiovisual media. Assistance was given area vocational schools for programs preparing scientific and engineering technicians. State departments of education were provided funds to enable them to improve their data-gathering function and provide facts needed for accurate reporting and better planning.

An additional title was added to the National Defense Education Act in 1964 extending training institutes to include teachers and supervisors in English, reading, history, and geography; teachers of disadvantaged youth; educational media specialists and school library personnel. This is indeed an omnibus act and touches more facets of the school's educational program than Federal aid hitherto.

Elementary and Secondary Education Act of 1965

The latest extension of the influence of the Federal Government in education is the Elementary and Secondary Education Act of 1965. This act is often associated with the war on poverty because title I, carrying the bulk of the financial support, is linked with economic deprivation. However, this recently enacted measure is defined as "an act to strengthen and improve educational quality and educational opportunities in the Nation's elementary and secondary schools" and will have quite a general impact. It is expected that as many as

9 out of 10 school districts will receive some funds under title I of the act.

A total of $1,300,000,000 was authorized under this act for fiscal 1966, although less than a billion dollars was actually appropriated for that fiscal year. The bulk of the funds, $775 million, is to be distributed under title I.

The goal of title I is to assist local school districts in meeting the needs of children who have been educationally deprived because of economic or cultural factors. The means of doing this are not rigidly prescribed, and each local school district is expected to tailor make its own plan for upgrading instruction for the disadvantaged. These plans are submitted to the State educational agency. Expenditures may be made for additional personnel, equipment, new curricular materials and techniques, provisions for liaison with the home and with community agencies, enrichment programs, guidance services, and work experiences. Indeed, imaginative local planning differentiated from community to community is encouraged. The State must certify to the Federal Government that basic requirements of title I are being met in order to receive Federal funds under this title. Programs must be directed toward the amelioration and elimination of educational deprivation. Services must be made available to nonpublic schoolchildren as well as to public schoolchildren. Evaluative procedures must be employed to attempt to measure the value of steps undertaken.

The amounts available to a school district under title I are determined through a formula which starts out with the number of school-age children who come from families in a district with annual incomes of less than $2,000. Children from families who receive more than $2,000 a year from Aid to Families with Dependent Children are also counted. This number of children is then multiplied by the average annual current expenditure per pupil in the State in which the school district is located. It can be seen that this type of financial support has some of the characteristics of an equalization aid program in a foundation program of school support.

Title II of the act carries an authorization of $100 million to assist in providing materials of instruction: the library books, textbooks, and audiovisual aids which are necessary to the educational program and which enrich instruction. A State plan is drawn up for the utilization of Federal funds. The materials purchased remain the property of a public agency, although they are to be made available to nonpublic school pupils as well as to public school pupils. In those States in which this runs contrary to legal enactments, the U.S. Commissioner of Education is empowered to make available to the children in private schools the same materials as are used in the public schools.

The stress in title III is twofold: (1) To promote innovations in educational programs which give promise of improving instruction; and (2) to extend a wide variety of educational services on at least a communitywide basis to both public and private schools so that the school programs of all schools in the area are enriched. Not all communities will qualify for the assistance proffered under this title. A community must propose establishment of a "supplementary educational center" and stipulate the services it intends to render and the new practices with which it expects to experiment. The guidelines will permit a wide variety of services to be included, and new types of undertakings are encouraged. Radio, television, and curriculum laboratory services may be provided. School museums may be established. Dramatic presentations, the theater, and the symphony orchestra may be made available to school children. Remedial instruction as well as specialized instruction to meet particular needs of pupils with all kinds of talents may be parts of the program. Shared-time programs, communitywide guidance services, and mobile science and language laboratories are examples of other proposals which have been advanced. A community's proposal is made to the State department of education for review and recommendation prior to being approved by the U.S. Office of Education. Varying activities will be carried on by the different centers established. It is intended that the results achieved by the various centers will be shared and that the gap will be reduced between what is proved to be sound education and what is actually practiced.

Title IV amends the Cooperative Research Act to authorize $100 million over a 5-year period to strengthen educational research. Different types of activities are supported. The research and development centers, four of which were established in 1964–65, may be increased in number. These centers are located at universities, and the research attack is interdisciplinary in character.

Besides the possible establishment of additional research and development centers, a major emphasis will be placed on inaugurating a number of regional, or possibly national, laboratories or research facilities. These will have a broader task than that assigned the research and development centers. Besides carrying on research, they are charged with the dissemination of research findings and the training of educational personnel. The cooperation and participation of different elements of the educational enterprise is essential. A regional laboratory is incomplete unless it involves at least one university, a State department of education, and many school systems on a regional basis. It has been said that the regional laboratory is the counterpart in education of the agricultural experiment station in the field of agriculture. A wide range of activities may be undertaken by an educational laboratory as conceived under this act. The guidelines for administration of the act state that:

> . . . Diversity of program is intended and expected in order that laboratories will respond in different ways to research needs and to the educational characteristics of the regions in which they are established and to the Nation as a whole.

Title IV provides for the continuation of the contract program whereby particular research projects submitted by individuals and universities may be supported financially. Private agencies and organizations are now eligible for such contract grants providing they are nonprofit in character. One provision of this title also stresses assistance to programs training educational researchers in recognition of the shortage of qualified research workers in the field of education.

Title V, the last, is designed to strengthen State departments of education. Each State department identifies its most pressing problems, and, in applying for its grant, shows how Federal funds will be used to strengthen such basic functions as data-gathering, statewide planning, curriculum development and dissemination, teacher education, consultative services to school districts, and educational evaluation. Much of the money will probably be spent to increase the staffing of State departments with qualified personnel. Provision is made for the interchange of staff between State departments of education and the U.S. Office of Education for periods not exceeding 2 years.

Aid to Higher Education

Mention has been made of the land grants which stimulated the establishment of land-grant colleges and of the provisions of the National Defense Education Act which affected higher education. Many other acts have had a major impact on colleges and universities. The GI bill, passed in 1944, enabled many veterans to attend college who might not otherwise have had this opportunity. The National Science Foundation was established in 1950, and was joined in 1965 by Federal foundations in the arts and humanities. The Cooperative Research Program came into being in 1954. Assistance in building construction is authorized under the Higher Education Facilities Act of 1963.

In October 1965, Congress passed one of the most important legislative acts benefiting education in recent years. The Higher Education Act of 1965 provides Federal assistance on seven major levels of higher education with the stipulation that such aid in no way authorizes Federal "direction, supervision, or control" over (1) the academic operation, resources, or personnel of any receiving institution; nor over (2) the membership practices or internal operations of private, social, or religious organizations at an institution of higher education whose facilities are not owned by the institution.

Specifically, the act defines its appropriations and grants under seven titles:

Title I—Community Service and Continuing Education Programs—is designed to enable the enlargement of university extension and continuing education programs and activities directed to the solution of community problems in rural, urban, or suburban areas.

Title II—College Library Assistance and Library Training and Research—provides grants to higher learning institutions for library materials, resources, and reorganization, in part to meet special national and regional library needs by enabling cooperative arrangements among libraries and specialization in single institutions.

Title III—Strengthening Developing Institutions—provides appropriations for cooperative programs such as faculty and student exchanges, the sharing of library and laboratory facilities, alternation of academic study and employment, and the introduction of new courses. National teaching fellowships are also provided for under these titles.

Title IV—Student Assistance—establishes educational opportunity grants and federally subsidized student loans to encourage the solicitation and enrollment of academically talented but needy students.

Title V—Teacher Programs—is directed toward improving the quality and increasing the number of America's teachers through the establishment of the National Teacher Corps for impoverished school districts and the provision of fellowships for graduate study.

Title VI—Financial Assistance for the Improvement of Undergraduate Instruction—authorizes grants to colleges and universities for teaching equipment and minor remodeling of undergraduate facilities.

Title VII—Amendments to the Higher Education Facilities Act of 1963—removes categorical restrictions of the kinds of facilities for which Federal grants were authorized in 1963.

Much research in higher education is dependent on Federal financing: two-thirds of the total research expenditures of colleges and universities are funded from Federal sources; and over 25,000 graduate students in mathematics, physical sciences, life sciences, and engineering are supported primarily by employment under Federal research contracts and grants. The contribution to knowledge made possible by these grants has been a major factor in accelerating scientific advance and in educating and developing the talent of outstanding youth. The major problem is the imbalance created in the research effort. Resources for research in the social and the behavioral sciences, the humanities, and the arts are starkly limited with the result that young people with multiple talents are steered toward fields in which their graduate study may be subsidized.

III. CHARACTERISTICS OF FEDERAL ASSISTANCE TO EDUCATION

Some summary statements which can be derived from the history of Federal aid are:

1. Federal aid is no Johnny-come-lately in educational financing. Since the founding of our country, land grants have been set aside for school support. National concern has been reflected in a variety of acts. Currently, Federal appropriations are increasing at a rapid rate with more and more aspects of the school program being affected.

2. Most Federal grants have been designed to strengthen particular aspects of the school's program, for example, vocational education. Until the Elementary and Secondary Education Act of 1965, and even to an extent under this act, the role of the Federal Government may be characterized as a broken-front approach with assistance provided to those aspects of the school's program which seem particularly critical. Federal financing, rather than being concerned with the overall health of the educational organism, tends of take the approach of treating today's infection, tomorrow's anemia. It should be recognized, or course, that overcoming the most marked deficiencies helps to strengthen the educational program as a whole. It is true, too, that the Federal Government's assistance in certain curricular areas may permit local school districts to have some financial leeway in providing more financial help locally for other aspects of the school's program. If assistance is available to improve certain educational services, then local money which might have been spent on them may be diverted to other areas of the curriculum. Of course, the matching requirements of some grants-in-aid may cause the opposite to be true. In order to qualify for the Federal grant, money must flow into the part of the educational program qualifying for Federal aid. However, local needs may dictate a higher priority for the use of this money elsewhere. The point is, thus far the Federal Government has not defined its function in education as that of a participating partner with the State and local school districts providing the finances for a "foundation program" embracing all areas of instruction essential to a minimum level of educational opportunity for each child.

3. Many Federal programs have been initiated because of problems of national concern. Education then serves as a vehicle to assist in solving a problem, and hence becomes somewhat of an indirect beneficiary. Thus, the Smith-Hughes Act was brought into being because the European apprentice system could not prepare the trained workers to supply the material needed in World War I; the depression measures of the 1930's were primarily to relieve unemployment; the school lunch program was begun because of huge agricultural surpluses rather than because of sudden recognition of need for better nutrition; and the National Defense Education Act was sparked by sputnik. An overall concern for a balanced educational program designed to meet the needs of each individual pupil has not yet been reflected in legislation at the national level.

4. Many Federal programs have been begun because local school districts and State systems of education have not met the problems of education or those associated with a reasonable opportunity for education. Civilian Conservation Corps programs were better designed for some school dropouts and untrained youth than were the formal educational programs in which they found themselves. The Job Corps is fulfilling a function that the schools have not fulfilled. Head Start is an effort to provide a better start for disadvantaged children. Educators had known of the problem but had devised no effective response. At the college level, few States have underwritten an adequate system of scholarships or guaranteed loans so that all who qualify can attend college. This becomes by default an area in which the Federal Government must intervene.

5. There is no overall coordination of Federal programs assisting education. Many programs are developed and sponsored by departments other than Health, Education, and Welfare. The role of the U.S. Office of Education is sometimes unclear. There is a need for better coordination at the national level.

6. It is said that the person who pays the piper calls the tune, yet the degree of control exercised

by the Federal Government over the educational program it assists varies greatly from program to program. In some instances, the guidelines for grants are very specific and can be objectively administered. In other instances, considerable flexibility is accorded State and local systems. This is true under the Elementary and Secondary Education Act of 1965. Even here, however, State and sometimes local plans are submitted to the Office of Education for approval. The stress is on innovation, but someone or some appraising group must judge whether a plan is sufficiently innovative and possesses enough promise of achievement to warrant Federal assistance.

IV. ISSUES RELATING TO FEDERAL AID TO EDUCATION

Should There Be Federal Aid to Education?

Down through the years, whether or not there should be Federal aid to education has been treated as a live issue. When the range and magnitude of Federal assistance programs now in effect is observed, however, it is usually concluded that it is not a question of whether there should be Federal aid, but rather of aid for what purposes, in what amounts, administered by whom, and subject to what controls.

The shifting of the tax base so that approximately two-thirds of all taxes are now collected at the Federal level has caused increasing consideration of this as a source of school support. State and local school systems have been unable with their own resources to erase the backlog of needed building construction dating back to World War II or to create salary levels for teachers to bring supply near to demand.

There are the stirrings of a concept that the Nation has a mandate to see that educational opportunity exists for each child. Increasingly, Federal legislation reflects this point of view. The country cannot stand by when the best efforts of an economically starved State cannot produce an effective State school program. The effects of poverty, cultural deprivation, and special handicaps must be combated. There can be no discrimination in federally assisted programs under the Civil Rights Act of 1964.

This growing national concern is voiced not only because it is the way of democracy that each person have an opportunity to develop to the fullest his abilities and his talents, but because an educated citizenry is prerequisite to our form of government and essential to the survival of this country as a world power.

The arguments advanced against Federal aid are that (1) it is unconstitutional, since education is a State and not a national responsibility; (2) Federal aid leads ultimately to Federal control; (3) the Federal budget should be reduced rather than increased; (4) there is an added administrative cost in sending tax moneys to Washington to be redistributed to the States; and (5) it has not yet been demonstrated that with sufficient effort local school districts and State educational systems cannot do the educational job.

Categorical Grants Versus General Support

A major issue is whether Federal aid should be used primarily as a means of dealing with high priority stress situations such as a shortage of classrooms, obsolescence in science education, and retraining to stave off unemployment, or whether Federal assistance should more generally underwrite the total school program. Advocates of general aid argue that Federal moneys are spent most efficiently if States and local communities are free to combine Federal funds with their own allocations and spend the money to meet the particular needs of each community. Federal aid in this instance is viewed as a means of insuring that at least a minimal educational opportunity is made available to each child. There is less likelihood of Federal control, and administrative costs are kept at a minimum under this plan. Large additions to the U.S. Office of Education and to State departments of education to administer Federal programs are unnecessary. In effect, the Federal Government serves primarily as a tax collector with the advantages of a tax system that possesses capacity, reflects ability to pay, and responds to changes in the economy.

The Federal Government has never accepted the principle of general aid except in the initial land grants associated with a State's entrance into the Union. Title I of the Elementary and Secondary Education Act of 1965 possesses some of the characteristics of general aid in that Federal funds are distributed on an "equalization basis." The poorer the district as measured by the number of families with incomes of less than $2,000, the greater the amount of Federal aid. If local districts were empowered to combine Federal funds with other revenues and spend them as they saw fit, this would truly be general aid. The Federal funds, however, must be spent to improve education for the disadvantaged under a plan approved by the State and ultimately by the Federal Government.

The major arguments put forth in favor of categorical grants are that they do take care of the emergencies identified by Congress; they provide the stimulus for improvements that States and local school districts have not chosen to make and might not make even though they were given general support; and they can place the Federal Government in a leadership role whereby stimulus is given to new and experimental programs.

Until 1964, professional educational organizations advocated general aid. That year, however, the Educational Policies Commission came to the conclusion that the political realities were such that general aid was not to be realized sufficiently soon to give badly needed assistance to the schools. The Commission then advocated that more categorical aid be sought for varying purposes, in the hope that Federal assistance might be given to enough facets of the school programs to achieve a longrun effect similar to that of general aid. The extensions of the National Defense Education Act to the fields of history, geography, English, and reading reflect such a point of view.

Emergency Aid Versus Continuing Support

Closely associated with the issue of general support versus categorical grants is the issue of whether Federal aid should be emergency aid of limited duration or if it should constitute continuing support. The task of Federal aid is sometimes presented as balancing the serious gaps, with the withdrawal of such aid anticipated when the deficiencies are overcome. Federal aid to school building construction is sometimes advocated not only because it can assist in meeting one of the most pressing problems, but because Federal aid can be withdrawn when the need is met. The White House Conference of 1956 espoused this view in its final report, stating that the long-range goal of any Federal aid is to eliminate the necessity for such aid. President Kennedy stated in his January 1963 message that Federal participation "should be selective, stimulative, and where possible, temporary."

Those who favor general-support legislation believe that a long-range commitment on the part of the Federal Government is essential and that the revenue resources of the Federal Government must be part of a Federal-State-local pattern of educational financing. There is also some evidence that certain types of categorical aid are likely to be carried on for a very substantial period of time. There has been assistance for vocational education since the passage of the Smith-Hughes Act in 1917. The need to aid the disadvantaged is likely to persist for at least a generation. If Federal aid is extended to include aid for teachers' salaries, it is unlikely that once begun, such aid would ever be removed. To a certain extent, aid to teachers' salaries might be a form of general aid, since at least two-thirds of a typical school budget is spent for professional salaries.

To What Extent Should Federal Control Accompany Federal Assistance?

Most Federal aid bills which have had general-support characteristics have in the past contained a stipulation that no department, agency, or officer of the Federal Government shall exercise direction or control over policy determination, curricular requirements, or the administration or supervision of any school or school system. On the other hand, nearly all categorical legislation contains some form of control. Although a wide variety of programs are possible under the Elementary and Secondary Education Act of 1965, no school district receives any assistance from the Federal Government unless it draws up plans and gets them approved, usually by both the State department of education and Federal Government. Grants assisting vocational education frequently stipulate teacher qualifications and curricular requirements.

Of course, accounting controls are necessary to be certain that moneys are spent for the purpose appropriated.

When Federal aid is channeled to local school districts through State departments of education, there is less chance of a centralized Federal system dictating educational change. Under present forms of categorical aid, however, the aid has been invoked in order to bring about specific changes in school programs—and with as much speed as possible. There can be no doubt that the Federal Government is, at the least, seeking to influence the direction of school programs. The question is, to what extent is this the legitimate role of the Federal Government and how far down the road of control does this lead?

Does Responsibility for the Evaluation of Results Accompany Financial Assistance?

If Federal aid is devised to overcome deficiencies or lags in the school program, appraisals of some type are going to be made of the extent to which infusions of money make any difference. Up to now, most of these evaluative judgments have been informal in character and may consist simply of the testimony of those who have had experience with the programs concerned. Since judgments can be extremely inaccurate, there is a trend toward gathering more objective data about the achievement of students in assisted areas. Title I of the Elementary and Secondary Education Act insists that local education agencies set up evaluation procedures to measure the extent to which the underwritten activities make a difference in the progress of disadvantaged pupils. It is probable that some States will adopt yardsticks to be applied on a statewide basis.

One of the major issues of the day is whether objective data can be gathered on a nationwide basis on the progress of education. Statistics relating to education tend to be of a quantitative character—numbers of students, teachers, school buildings, and expenditures—with little of a qualitative character. It is argued that just as the state of the Nation's economy can be indicated in gross terms by the gross national product, so dependable information can be gathered about the outcomes of the school program; i.e., the extent to which the various "inputs" fed into the schools result in better achievement. Such an undertaking is complicated. The best description of present thinking in this area is provided by Tyler:

> Samples of children, youth, and adults carefully chosen to represent geographic areas; socioeconomic levels; and rural, urban, central city, and suburban populations would provide data without anyone or any classroom taking a full assessment battery or getting a score or report from it. Because the assessment exercises can be given individually and by interview, it is possible to sample more than the content of the traditional paper-and-pencil tests. Performance, interests, skills, habits, and the like can be included.[1]

It is contemplated that the assessment battery would be used at four age levels: 9, 13, 17, and the adult level. Repeated assessments every 3 or 4 years would provide concrete information concerning educational progress.

The provision for sampling is advocated in order to preclude direct comparisons of child with child and school district with school district, yet still provide sufficient data to indicate where progress is pronounced and where it lags.

There are many who oppose a program of national assessment because the end results which the tests seek to measure could in turn become the goals of education. For example, teachers would teach for what is being tested. A rigid, stultified, centrally controlled curriculum could emerge with innovation and experimentation curtailed. Or so the critics of national assessment contend.

Federal Funds to Private Schools?

One of every seven children of compulsory school age is enrolled in a private school. The noninclusion of private schools in Federal aid programs is frankly acknowledged as a factor in the defeat of several Federal aid bills, and it is doubtful that the Elementary and Secondary Education Act of 1965 could have been passed without some of its benefits having been extended to nonpublic schools.

The States have faced this question before, with varying interpretations being accorded State constitutional stipulations regarding separation of church and state. In some States, assistance of any type is ruled unconstitutional. In others, the child-benefit theory operates which permits such services as pupil transportation services, school health services, and textbooks for private as well as public school students. In a number of States, shared-time arrangements are in effect in which students attend the public school for part of the schoolday to study such subjects as mathematics, science, industrial arts, home economics, and physical education. For the remainder of the day, they attend the private school for such subjects as English, social studies, and religious history and doctrine.

The Elementary and Secondary Education Act of 1965 stipulates that the benefits of the act are to be extended to nonpublic as well as to public school pupils, although title to any property and administrative supervision rests with the public agency under titles I and III. Services made possible by Federal funds such as educational radio and television, educational media centers, mobile laboratories, visiting teacher services, and inservice training of teachers are to be available to both public and private schools. The possible conflict with State constitutional provisions has not been fully assessed, and these matters will undoubtedly be tested in court.

There are many private school leaders who contend that since the State recognizes the right of the parent to send his child to a private school and since children in attendance in private schools are counted as fulfilling the compulsory school attendance requirement, there is societal recognition that private schools fulfill the task of preparing their children for citizenship and induction into adult life. They should, therefore, receive tax moneys on the same basis as public schools. If the private schools did not perform this function, they argue, the public schools would be required to take care of the students.

There is no denying that many private schools exist to inculcate religious concepts; otherwise they would not have been established. Can the educational program of these schools be underwritten in whole or in part without violating the first amendment? A body of legal opinion and case law will be required to answer this question. In the meantime, aid to nonpublic schools continues to be a very debatable issue fraught with emotional overtones.

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[1] Ralph W. Tyler, "Assessing the Progress of Education," *Phi Delta Kappan*, 47: 14 (September 1965).

V. THE ROLE OF THE FEDERAL GOVERNMENT IN THE YEARS AHEAD

What lessons can be learned from the historical role played by the Federal Government? What position can be taken in regard to some of the issues set forth?

The Federal Government—A Participating Partner

The time is past when it can be unequivocably said that education is exclusively a State function. It is, of course, a State function, but there are national needs that must be met by education, and education must be a servant of national purpose. Fortunately the goals for education at local, State, and national levels tend to be consonant. What is required is recognition of the need for a local-State-Federal partnership.

Federal Assistance—A Requisite in Both General and Categorical Aid

Proper financing for education requires substantial revenues from all the partners. Local and State financing alone is not equal to the task. On the part of the Federal Government, general aid should be employed to establish a foundation concept of school support at the national level.

In State school financing, a foundation support program operates as follows: A State determines the kind of educational opportunities and the nature of the school program which should be available to every child and young person. It then estimates the cost of that program in dollars per pupil. Local school districts are expected to make a reasonable effort to finance the foundation program, with such an effort usually measured in terms of a tax rate on the equalized property valuation of the school district. If the reasonable effort of the local district does not yield the dollars needed to finance the foundation program, the State steps in with sufficient funds to make up the remainder. The goal is that no child shall be deprived of at least a minimal level of educational opportunity.

Our national aspiration demands this as a common goal, yet not all States have defined a foundation program. And many of those that have are appropriating funds insufficient to fulfill the dollar requirements specified. If the Federal Government enters into financing schools as a partner with State and local governments, it should do so with the assurance that the total appropriations from all three governmental units will guarantee a minimum foundation program. As far as general aid is concerned, the one Federal requirement or control should be that Federal funds will be augmented by the States and localities in amounts sufficient to underwrite the foundation program. The amount of Federal assistance for any one State should be a sufficient supplement to realize the foundation amount once the State and its school districts have made a reasonable tax effort.

Until serious gaps in the educational program are overcome, categorical aid will also be needed. We must continue to take the necessary steps to overcome the handicaps faced by the culturally deprived. Vocational education programs responsive both to the needs of individuals and the job opportunities available must be strengthened. While general aid will be a long-range, continuing commitment enabling education to tap the dominant tax resources of the country, categorical aid will be stimulative, to be withdrawn when the objective is achieved or when the services being performed can be incorporated in the concept of the foundation program.

Organizing the Federal Government To Play a Leadership Role

The recent reorganization of the U.S. Office of Education to serve more in a leadership role, place increasing emphasis on long-range planning, heighten its function in stimulating research, and strengthen the channels of communication with State departments of education will make this a more effective Federal agency. The problem still exists as to how Federal educational policy can best be formulated. (Ch. 8 is addressed to this point.)

It is very evident that better coordination is needed of the different programs in education carried on by more than a score of Federal agencies. All told, the dollar value of programs not under the direction of the U.S. Office of Education exceeds $1 billion annually. Some of these programs undoubtedly should remain within their sponsoring agency, but too often each Federal agency operates in isolation, without communicating and coordinating with others.

National Assessment: An Imperative

We must learn whether we are making progress in realizing our educational goals; where more effort needs to be made; where categorical aid is warranted.

The problem is that we have trouble agreeing on goals, and we fear that measures used to assess progress will not be valid and will bring about a centrally controlled curriculum.

It should be recognized that we do not now have instruments to do the job. But we should not assume that the job cannot be done—and done without the concomitants so bleakly depicted by the opponents of any form of appraisal. The Exploratory Committee on Assessing the Progress of Education (the national assessment program headed by Ralph Tyler) has devised an elaborate sampling scheme to avoid direct pupil comparisons and district-by-district rivalry. The kinds of achievement to be measured include many aspects of performance, not just verbal learning. Tyler has stated that:

> . . . the areas of assessment will include much more than the three R's. Hence the assessment should remind the public of the range of educational objectives being sought by modern schools rather than limiting its attention to a small part of the educational program.[3]

The effort to devise the necessary instruments should be encouraged. If in tryout situations they prove invalid, restrictive, or impossible to administer, they need not be applied on the national level. But to oppose this development because abuses are possible which may not occur seems to fly in the face of badly needed progress. The day will come when we will be able to measure at least some of the outcomes of instruction, when educational programs can be modified to better meet desirable goals, when educational lag can be identified and dealt with.

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[3] Ralph W. Tyler, *op. cit.*, p. 14.

Appendix

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